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College of Hawaii Publications

COLLEGE RECORDS

NUMBER 10

COLLEGE OF HAWAII
ANNUAL CATALOGUE
1912-1913



HONOLULU:
PUBLISHED BY THE COLLEGE
APRIL, 1913

JULY 1913

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JUNE 1914

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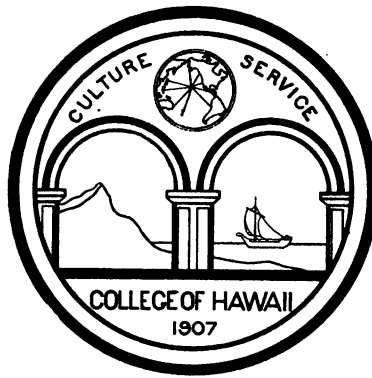


College of Hawaii Publications

COLLEGE RECORDS

NUMBER 10

COLLEGE OF HAWAII
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1912-1913



HONOLULU:
PUBLISHED BY THE COLLEGE
APRIL, 1913

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Librarian.

*Resigned January 1, 1913.

CALENDAR.

1913—1914.

1913

January 27	Second semester begins	Monday
February 22	Washington's Birthday	Saturday
May 30	Memorial Day	Friday
May 31	Second semester ends	Saturday
September 4	Entrance Examinations begin	Thursday
September 8	Academic Year begins. Matriculation of new students.	Monday
September 9	Instruction begins	Tuesday
Nov. 29-Dec. 1.	Thanksgiving Recess	Thurs. to Sat.
December 22	Christmas Recess begins	Monday

1914

January 5	Work resumed	Monday
January 24	First semester ends	Saturday
January 26	Second semester begins	Monday
February 23	Washington's Birthday	Monday
May 29	Second semester ends	Friday
May 30	Memorial Day	Saturday
September 14	Academic Year begins	Monday

THE COLLEGE OF HAWAII

The College of Hawaii owes its origin to an act of Congress, entitled "An Act Donating Public Lands to the several States and Territories which may provide Colleges for the benefit of Agriculture and the Mechanic Arts," approved July 2, 1862. The amount of land set aside was 30,000 acres for each Senator and Representative in Congress. This land was to be sold and the income devoted to "The endowment, support, and maintenance of at least one college where the leading object shall be, without excluding other scientific and classical studies, and including military tactics, to teach such branches of learning as are related to agriculture and the mechanic arts (in such manner as the Legislatures of the States may respectively prescribe), in order to promote the liberal and practical education of the industrial classes in the several pursuits and professions of life."

Three purposes are pointed out in this law, namely: To provide for a liberal education, to give intellectual training in the branches of learning that are related to agriculture and the mechanic arts, and to offer this instruction to the industrial classes. The College of Hawaii is organized to carry out these objects.

The College owes its existence and maintenance to the following resolution and act:

CONCURRENT RESOLUTIONS, ADOPTED MAY 25, 1906.

"WHEREAS, the industries of this Territory are almost exclusively agricultural, and our future development must depend for its best progress upon the thorough education of our youth; and,

"WHEREAS, the Federal Government has provided a means for the establishment and maintenance of Colleges of Agriculture and Mechanic Arts; therefore, be it

"*Resolved*, by the Legislature of the Territory of Hawaii in Special Session assembled, that the Commissioners of Public Instruction are hereby authorized and directed to thoroughly investigate the requirements under the Federal Law, the probable expense to the Territory, a possible practical site for such a college, the suitableness of Lahainaluna for such a purpose, and

other details that will enable prompt and intelligent action should it be desirable, and report to the next regular session of the Legislature."

The above resolution was framed by Mr. Wallace R. Farrington, and introduced by Representative Coelho, of Maui.

After considerable investigation by a Committee of the Department of Public Instruction, consisting of the Commissioners and the Superintendent, a report was presented to the Legislature, which resulted in the appointment of a Special Committee, selected by the Governor from members of the University Club, consisting of the Hon. H. E. Cooper, Mr. C. R. Hemenway, and Mr. R. S. Hosmer. An act was framed and introduced by Senator Coelho, and passed by the Legislature at the regular session of 1907 without opposition. The act follows:

ACT 24, *Session Laws of the Legislature of Hawaii*, 1907, as amended by ACT 44, *Session Laws*, 1911.

AN ACT

TO ESTABLISH THE COLLEGE OF AGRICULTURE AND MECHANIC ARTS OF THE TERRITORY OF HAWAII, AND TO PROVIDE FOR THE GOVERNMENT AND SUPPORT THEREOF.

Be It Enacted by the Legislature of the Territory of Hawaii:

"SECTION 1. There is hereby established a College of Agriculture and Mechanic Arts, to be known as the College of Hawaii, which shall be under the general charge of a Board of Regents, appointed in the manner prescribed in Section 80 of the Organic Act."

"SECTION 2. The Regents shall be residents of the Territory of Hawaii, and shall be appointed for terms of five years, or the unexpired period thereof, in such manner that the term of one Regent shall expire each year. Such terms shall begin on the first day of May in each year, and the terms of the present Regents, in the order of their appointments, shall continue to and expire immediately preceding such day in each of the five years beginning with 1912."

"SECTION 3. The Board of Regents shall have the general management and control of the affairs of the College. They shall have power to appoint a Treasurer and such other officers

as they deem necessary, and to require them to give bonds in such amounts as they may prescribe and in the form prescribed by law for bonds of public officers. They shall have power to purchase or otherwise acquire lands, buildings, appliances and other property for the purpose of the College, and expend such sums of money as may be from time to time placed at the disposal of the College from whatever source. All lands, buildings, appliances and other property so purchased or acquired shall be and remain the property of the Territory of Hawaii, to be used in perpetuity for the benefit of the College.

The grants of moneys and the purposes of said grants authorized by the Acts of Congress, approved March 2, 1887, August 30, 1890, and March 16, 1906, respectively, known as the Hatch Act, the Second Morrill Act, and the Adams Act, respectively, providing for agricultural experiment stations in connection with colleges of agriculture and mechanic arts, and by any other Act or Acts of Congress for similar purposes, are hereby assented to."

"SECTION 4. The purposes of the College are to give thorough instruction in agriculture, mechanic arts and the natural sciences connected therewith, and such instruction in other branches of advanced learning as the Board of Regents may from time to time prescribe, and to give such military instruction as the Federal Government may require. The standard of instruction in each course shall be equal to that given and required by similar colleges on the mainland, and upon the successful completion of the prescribed course the Board of Regents are authorized to confer a corresponding degree upon all students who shall become entitled thereto."

"SECTION 5. No person shall, because of age, sex, color or nationality, be deprived of the privileges of this institution."

"SECTION 6. The Faculty of the College shall be under the direction of a President, who shall be appointed by the Board of Regents. The members of the Faculty shall be likewise appointed."

"SECTION 7. The official name of the Board of Regents shall be Board of Regents, College of Hawaii, and the Board shall adopt and use a common seal by which all official acts shall be authenticated."

"SECTION 8. The Board of Regents shall have the authority to sue in its official name, and shall be subject to be sued only

in the manner provided for suits against the Territory of Hawaii."

"SECTION 9. Moneys appropriated by the Legislature for the College of Hawaii shall be payable by the Territorial Auditor, upon vouchers approved by the Board of Regents. All moneys received by or on behalf of the Board or College, other than those received from the United States Government, shall be paid into the Territorial Treasury, and all such moneys are hereby appropriated for the use of the College. The Board of Regents shall cause to be kept suitable books of account, and shall annually submit to the Governor, to be by him submitted to the Legislature, a statement showing its receipts from all sources, and expenditures for all purposes."

SUPPORT AND ORGANIZATION.

Being a Territory, Hawaii does not benefit financially by the Land Grant Act of 1862; but it does benefit by the Morrill Act of 1890, which supplements the previous act by an appropriation of twenty-five thousand dollars per year. It also benefits from the Nelson Amendment to the Morrill Act, passed in 1907, and appropriating five thousand dollars with an annual augmentation of five thousand dollars until the total amount shall be twenty-five thousand dollars. By virtue of these two Acts, the College of Hawaii received in the year 1911-12 from the Federal Treasury fifty thousand dollars, and will receive that amount annually hereafter.

According to the terms of these Acts, the funds appropriated are "to be applied only to instruction in agriculture, the mechanic arts, the English language, and the various branches of mathematical, physical, natural and economic science, with special reference to their applications in the industries of life, and to the facilities for such instruction." The purchase from this money of apparatus, machinery, text-books, reference books, stock and material used in instruction, or for the purposes of illustration in connection with any of the branches enumerated, and the payment of salaries of instructors in said branches is authorized.

The expenditure of any portion of these funds for the pur-

chase, erection, preservation or repair of any building or buildings, or for the purchase of land, is prohibited.

The salaries of purely administrative officers, such as the president, treasurer, secretaries, bookkeepers, janitors, watchmen, etc., cannot be charged to this fund, nor can it be expended for furniture, cases, shelving, desks, lockers, salaries for instruction in philosophy, psychology, ethics, logic, history, political science, civics, pedagogy, and in ancient and modern languages (except English).

The Territory, therefore, provided lands and buildings and cares for the maintenance and improvement of all the property. In addition to this it devolves on the Territory to provide for the salaries for the administration of the College, for the librarian, clerical help, and for instruction in those subjects not provided for by Federal funds, such as modern languages (except English) and the various non-vocational subjects provided for in the curriculum. The Territory has met its obligations in these respects in accordance with the need and growth of the Institution.

For the permanent home of the College, about ninety acres of land have been secured in Manoa Valley. A plan for the development of the College has been prepared, showing the relative positions of the various buildings for the branches of instruction that fall normally within the scope of activities of such an institution. The first of these buildings has been provided by an appropriation of the Legislature, session of 1911. This building was ready for occupancy at the beginning of the current collegiate year (1912-1913). The available land and the consummation of this plan will afford adequate facilities for all lines of work. A stream borders the property on one side, which when properly developed will furnish excellent facilities for power and experimental studies in irrigation and hydraulics. The remainder will be utilized for campus, pasture, experimental and demonstration grounds in agriculture and for the field work in engineering subjects.

The Library now contains about 10,000 volumes of the more recent works on Agriculture, Engineering, the Mechanic Arts, the various Mathematical, Physical, Chemical and Natural Sciences,

as well as an excellent collection of books in English and in German Literature. In addition there are on the shelves about 9000 pamphlets, mostly Bulletins of Agricultural Experiment Stations and of the United States Department of Agriculture. The Library has been made a depository for all Government publications.

The Library is open to the public, and persons complying with the regulations may withdraw books for home use.

REQUIREMENTS FOR ADMISSION.

The College is normally the crowning point of the school system of the Territory, and it is intended that its entrance requirements shall co-ordinate with the requirements for graduation of the higher schools and academies located throughout the Territory, to the end of facilitating entrance from these to the College.

Candidates may be admitted to the College in one of four ways, as follows:

- (a) By examination in specified subjects.
- (b) By certificate from an accredited school, or from the College Entrance Examination Board.
- (c) By transfer from other colleges or universities.
- (d) By meeting the requirements prescribed for special students.

ADMISSION BY EXAMINATION.

Examinations for admission will be held at the College on Thursday, Friday and Saturday, Sept. 4th, 5th and 6th, 1913.

Hours for examination will be arranged by appointment.

Candidates for admission to the College by examination must register at the office of the President not later than 9:00 A. M. on the first day of examination.

Candidates for admission to the College by examination must attain a grade of 60 per cent. in each subject.

Credits obtained by examination will hold good for one year.

ADMISSION BY CERTIFICATE.

Candidates for admission by certificate, other than that furnished by the College Entrance Examination Board, must pre-

sent certificates endorsed by the principal of the school in which the preparatory work has been done. Blank certificates will be furnished on application, and should be returned to the College properly filled out as soon thereafter as possible. Certificates must state definitely the amount of work done and the text-books used. After examination of the certificates submitted, candidates will be notified that credits are approved or that they must submit to entrance examinations in those subjects for which credits are held to be unsatisfactory.

ADMISSION AS SPECIAL STUDENT.

Persons not less than eighteen years of age will be admitted to the College as "special students," either at the beginning of the college year or at the beginning of the second semester, provided they furnish satisfactory evidence of previous training and a detailed statement of courses desired. Previous training shall be deemed satisfactory that manifestly enables the student to carry on the work chosen. No student, however, who has been in attendance at any preparatory school shall be admitted as a special student before his class has graduated, except by special permission of the Faculty of the College of Hawaii.

Applicants for special courses should present to the President of the College or to a properly authorized college officer, all pertinent documents not later than the day preceding the opening of the semester in which the applicants desire to enroll.

Permission to enroll as a special student shall bear the signed approval of the President of the College and of the officers in charge of the courses desired. Special students shall be subjected to the same standard of work in courses and to the same requirements regarding attendance at recitations, lectures, laboratory exercises, tests and term examinations as are the regular students of the College.

ADMISSION TO THE FRESHMAN CLASS.

Fifteen credits, each credit signifying five exercises a week for one academic year, are required, as follows:

Group I. Nine and one-half credits are prescribed, as follows:

English	3
German or French	2
General History	1
Algebra	1½
Plane Geometry	1
Physics	1

9½

Group II. Five and one-half credits are to be selected from the following:

English	1
Latin or Greek	2
United States History	1 or ½
English History	1 or ½
Civil Government	1 or ½
Plane Trigonometry*	½
Solid Geometry*	½
Astronomy	½
Chemistry	1
Botany	1 or ½
Geology	½
Physiology	½
Zoology	1 or ½
Commercial Law	½
Book-keeping	½
Stenography	½
Physical Geography	½

* Required of candidates desiring to specialize in Engineering.

ADMISSION TO ADVANCED STANDING.

Candidates for advanced standing must present credits satisfactory to the College. No student will be accredited beyond the Junior year.

ENTRANCE SUBJECTS IN DETAIL.

ENGLISH (GROUP I).

The three credits in English should signify the completion of the following work:

- (a) Complete Grammar1 credit
- (b) Rhetoric and Composition.....1 credit
- (c) Collateral reading, classroom
study and practice.....1 credit, or 2 credits*

*Candidates presenting 4 credits in English will be required to offer 2 credits in this work.

The examination in English will deal chiefly with the books prescribed for reading and study by the College Entrance Examination Board. There will also be questions dealing with the candidate's own experience.

The questions will not deal with minute or technical points, for the examination is designed chiefly as a test of the candidate's power to think clearly and connectedly and to express his thoughts correctly and idiomatically. Attention will be paid to spelling, punctuation, use of capital letters, exact and idiomatic use of words, grammatical correctness, and, even more closely, to the construction of sentences and of paragraphs. In preparation for this examination, the candidate should be given frequent practice in written expression, and should be encouraged to think for himself rather than merely to restate the thoughts of others.

REQUIRED FOR READING.

FOR 1913-1915.

With a view to a large freedom of choice, the books provided for reading are arranged in the following groups, from which at least ten units* are to be selected, two from each group:

Group 1.

The "Old Testament," comprising at least the chief narrative episodes in "Genesis," "Exodus," "Joshua," "Judges," "Samuel," "Kings" and "Daniel" together with the books of "Ruth" and "Esther;" the "Odyssey," with the omission, if desired, of Books I, II, III, IV, V, XV, XVI, XVII; the "Iliad," with the omission, if desired, of Books XI, XIII, XIV, XV, XVII, XXI; Vergil's "Aeneid." The "Odyssey," "Iliad," and "Aeneid" should be read in English translations of recognized literary excellence.

* Each unit is set off by semicolons.

(For any unit of this group a unit from any other group may be substituted).

Group 2.

Shakespeare's "Merchant of Venice;" "A Midsummer Night's Dream;" "As You Like It;" "Twelfth Night;" "Henry the Fifth;" "Julius Cæsar."

Group 3.

Defoe's "Robinson Crusoe," Part I; Goldsmith's "Vicar of Wakefield;" either Scott's "Ivanhoe," or "Quentin Durward;" Hawthorne's "House of the Seven Gables;" either Dickens' "David Copperfield," or "A Tale of Two Cities;" Thackeray's "Henry Esmond;" Mrs. Gaskell's "Cranford;" George Eliot's "Silas Marner;" Stevenson's "Treasure Island."

Group 4.

Bunyan's "Pilgrim's Progress," Part I; the "Sir Roger de Coverley Papers" in "The Spectator;" Franklin's "Autobiography" (condensed); Irving's "Sketch Book;" Macaulay's "Essays on Lord Clive and Warren Hastings;" Thackeray's "English Humourists;" "Selections from Lincoln," including at least the two Inaugurals, the Speeches in Independence Hall and at Gettysburg, the Last Public Address, and Letter to Horace Greeley, along with a brief memoir or estimate; Parkman's "Oregon Trail;" either Thoreau's "Walden," or Huxley's "Autobiography" and selections from "Lay Sermons," including the addresses on Improving Natural Knowledge, A Liberal Education, and A Piece of Chalk; Stevenson's "Inland Voyage" and "Travels with a Donkey."

Group 5.

Palgrave's "Golden Treasury" (First Series), Books II and III with especial attention to Dryden, Collins, Gray, Cowper, and Burns; Gray's "Elegy in a Country Churchyard" and Goldsmith's "Deserted Village;" Coleridge's "Ancient Mariner" and Lowell's "Vision of Sir Launfal;" Scott's "Lady of the Lake;" Byron's "Childe Harold," Canto IV, and "The Prisoner of Chillon;" Palgrave's "Golden Treasury" (First Series), Book IV, with especial attention to Wordsworth, Keats, and Shelley; Poe's "Raven," Longfellow's "Courtship of Miles Standish" and Whittier's "Snow Bound;" Macaulay's "Lays of Ancient Rome" and Arnold's "Sohrab and Rustum;" Tennyson's "Gareth and Lynette," "Lancelot and Elaine," and "The Passing of Arthur;" Browning's

"Cavalier Tunes," "The Lost Leader," "How They Brought the Good News from Ghent to Aix," "Home Thoughts from Abroad," "Home Thoughts From the Sea," "Incident of the French Camp," "Hervé Riel," "Pheidippides," "My Last Duchess," "Up at a Villa—Down in the City."

STUDY.

Shakespeare's "Macbeth;" Milton's "L'Allegro," "Il Penseroso," and "Comus;" either Burke's "Speech on Conciliation with America," or both Washington's "Farewell Address" and Webster's "First Bunker Hill Oration;" either Macaulay's "Life of Johnson" or Carlyle's "Essay on Burns."

GERMAN (GROUP I.)

Candidates offering German should have completed at least a systematic course of five exercises a week extending throughout two academic years. The preparation should include a thorough elementary knowledge of the gender of nouns and the declension of nouns and adjectives; the personal, interrogative, relative, and demonstrative pronouns; the strong and the weak conjugations, the principal parts of the simpler strong verbs, the use of the modal auxiliaries, the use of the passive voice; the use of adverbs, prepositions, conjugations; the various German sentence orders. Candidates should possess the ability of reading German with a clear and good pronunciation, of writing German readily from dictation, of translating with comparative ease elementary German into English and vice versa. Candidates should also have read a reasonable amount of acceptable German stories, such as: Storm's "Immensee," W. von Hillern's "Hoher als die Kirche;" well known German lyrics; Gerstaecker's "Germelshausen;" Heyse's "L'Arrabiata;" Zschokke's "Der zerbrochene Krug;" or their equivalents either in narrative or dramatic literature, and should have read at least one standard work of German literature such as Goethe's "Hermann und Dorothea," Lessing's "Minna von Barnhelm" or Schiller's "Wilhelm Tell."

FRENCH (GROUP I.)

Candidates offering French should have completed at least a systematic course of five exercises a week extending throughout

two academic years. The preparation should include a thorough elementary knowledge of the rudiments of grammar, including the plural of nouns, the inflection of adjectives, participles, and pronouns; the use of personal pronouns and the pronominal adjectives; the irregular verb forms; the simpler uses of the conditional and the subjunctive; common adverbs, prepositions, and conjunctions; the order of words in the sentence, and the elementary rules of syntax. Candidates should possess the ability of reading French with a clear and good pronunciation, of writing French readily from dictation, of translating with comparative ease elementary French into English and vice versa. Candidates should also have read a reasonable amount of acceptable French stories, such as Mérimée's "Colomba," Loti's "Pêcheur d'Islande," Jules Sandeau's "Mademoiselle de la Seiglière" or their equivalents, either in narrative or dramatic literature, and should also have read at least one standard work of French literature, such as Molière's "L'Avare," Corneille's "Le Cid," Racine's "Athalie," or a work by such writers as About, Béranger, Daudet, Le Brète, Madame de Sévigné, Hugo, Labiche, George Sand, Sandeau, Scribe, Thiers, Vigny, Voltaire.

LATIN (GROUP II).

Candidates offering Latin should have completed at least a systematic elementary course of five exercises a week extending throughout two academic years. The preparation should include the study of Latin forms and inflection, the practice of reading at sight and of writing from dictation, the knowledge of elementary syntax and etymology. The candidate should have read and reviewed at least Cæsar's Gallic War, Books I--IV, or an equivalent, and not less than two of Cicero's Orations. Work should also have been done in composition.

GREEK (GROUP II).

Candidates offering Greek for entrance should have completed at least a systematic elementary course of five exercises a week extending throughout two academic years. The preparation should include the study of Greek forms and inflection, the practice of reading at sight and of writing from dictation, the knowledge of etymology and syntax. The candidate should have read

and reviewed at least Xenophon's *Anabasis*, Books I--III, or an equivalent. Work should also have been done in composition.

GENERAL HISTORY (GROUP I).

The one credit in general history should cover an amount equal to Anderson's or Meyer's "General History."

UNITED STATES HISTORY (GROUP II).

Candidates offering one credit in United States history should have completed a course equivalent to five exercises a week throughout one academic year. Preparation should cover the subject as presented in such texts as:

McLaughlin's "History of the American Nation."

Channing's "Student's History of the United States."

Hart's "Essentials in American History."

For one-half credit in this subject, one-half the time indicated above will be accepted.

ENGLISH HISTORY (GROUP II).

Candidates offering one credit in English history should have completed a course equivalent to five exercises a week extending throughout one academic year. The preparation should cover the subject as presented in such texts as:

Larned's "History of England."

Cheney's "Short History of England."

Green's "Short History of the English People."

For one-half credit in this subject one-half the time indicated above will be accepted.

CIVIL GOVERNMENT (GROUP II).

Candidates offering one credit in civil government should have completed a course equivalent to five exercises a week extending throughout one academic year. The work should cover the essentials of a republican form of government as presented in such text-books as:

Fiske's "Civil Government."

Boynton's "School Civics."

Macey's "Civil Government."

For one-half credit in this subject, one-half the time indicated above will be accepted.

ALGEBRA (GROUP I).

The one and one-half credits in algebra require thorough acquaintance with the following topics: the fundamental operations; involution and evolution; factoring, highest common factor, lowest common multiple; fractions; simple and quadratic equations involving one unknown quantity; simultaneous equations, simple and quadratic; equations involving radicals, and equations reducible to quadratic form; theory of indices. The preparation should be equivalent to five exercises a week for at least one and one-half years in such texts as:

Beman and Smith's "Academic Algebra."

Taylor's "Elements of Algebra."

Tanner's "Elementary Algebra."

GEOMETRY (GROUPS I AND II).

The credits in geometry require familiarity with the subject as treated in Beman and Smith's "Plane and Solid Geometry," or an equivalent text; a clear understanding of the meaning and use of locus propositions; ability to originate proofs and constructions, and to apply theorems of proportion and of mensuration in numerical computations.

In plane geometry the preparation should be the equivalent of five periods a week for one year; in solid geometry of five periods a week for one-half year.

TRIGONOMETRY (GROUP II).

Candidates offering plane trigonometry should have completed a course equivalent to five exercises a week throughout one-half an academic year. The preparation should cover proofs of formulæ, transformation of formulæ, solution of equations and of triangles with or without logarithms, as presented in such texts as:

Wentworth's "Revised Trigonometry" (second revision).

Phillips and Fisher's "Elements of Trigonometry."

Bowser's "Elements of Trigonometry."

ASTRONOMY (GROUP II).

Candidates offering astronomy should have completed a course equivalent to five exercises a week throughout one-half an

academic year in such a text as Young's, and should be able to recognize the more important fixed stars and to describe the characteristics and motions of the members of the solar system. Practice with the telescope is not essential, but the course should be accompanied by naked-eye observations of planetary movements.

PHYSICS (GROUP I).

The credit in physics requires the completion of the subject as given in the High School text-books of Hall and Bergen, Milliken and Gale, Wentworth and Hill, or other late texts of the same grade. The study should extend throughout one academic year. It is recommended that it be accompanied by laboratory work covering at least forty experiments of a quantitative character. A note-book giving satisfactory evidence of laboratory work done should be submitted. In addition a thorough working knowledge of the metric system of weights and measures is required.

CHEMISTRY (GROUP II).

Candidates offering chemistry should have studied the subject for one academic year, and should be familiar with the following topics: properties of the principal non-metallic elements and their compounds; simple problems involving relations by weights and relations between volumes of gases and weights of chemically related liquids and solids; acids, bases, and salts; atoms, molecules, atomic weights, and valence; series of oxy-acids and their salts; oxidation and reduction; poly-acids; acid anhydrides and metallic oxides. The text-book should be of the same grade as Henderson and McPherson's "Elementary Chemistry" or Peters' "Modern Chemistry."

BOTANY (GROUP II).

Candidates offering one credit in botany should have completed a course equivalent to five exercises a week throughout one academic year. The preparation should cover the structure, elementary physiology, and classification of the seed-bearing plants; and should include laboratory and field exercises. Note books must be presented, showing laboratory and field work. Such texts as Bailey's "Elementary Botany" and Atkinson's "Elementary Botany" are recommended. Candidates who offer one-

half credit should have followed the subject for one-half the time indicated above.

GEOLOGY (GROUP II).

Candidates offering geology should have completed a course equivalent to five exercises a week throughout one-half an academic year, in such texts as:

Tarr's "Elementary Geology."

Le Conte's "Elements of Geology."

Brigham's "Geology."

PHYSICAL GEOGRAPHY (GROUP II).

Candidates offering physical geography should have completed a course equivalent to five exercises a week throughout one-half an academic year, in such texts as:

Dryden's "Lessons in Physical Geography."

Brigham and Gilbert's "Physical Geography."

Tarr's "Physical Geography."

PHYSIOLOGY (GROUP II).

Candidates offering physiology should have completed a course equivalent to five exercises a week throughout one-half an academic year. The preparation should cover the hygiene, the morphology, and the functions of the organs of the human body as presented in Martin-Fitz's "Human Body" or an equivalent text.

ZOOLOGY (GROUP II).

Candidates offering one credit in zoology should have completed a course equivalent to five hours a week throughout one academic year, covering the salient characteristics of the branches, classes, and orders of animals, with special emphasis on laboratory study of type specimens in each class. The texts recommended are:

Needham's "Elementary Lessons in Zoology."

Kellogg's "Elementary Zoology."

Catton's "Practical Zoology."

COMMERCIAL LAW, BOOKKEEPING, AND STENOGRAPHY
(GROUP II).

Candidates offering one-half credit in any of these subjects must furnish documentary evidence of the amount and character of the work done.

COURSES AND DEGREES.

The College of Hawaii, without excluding ideals of scholarship and culture, fosters education for service, and emphasizes for its students and for those interested in its welfare the fact that all vocations or activities by which men and women obtain a living or from which they derive æsthetic stimulus have elements of educational value, that all work productive of good is dignified, and that men and women should be educated toward wholesome service rather than away from it.

To this end, the College offers instruction in the following courses, namely:

1. A course in Agriculture, leading to the degree of Bachelor of Science in Agriculture.
2. Courses in Civil, Mechanical and Electrical Engineering, leading to the degree of Bachelor of Science in Engineering; the diploma designating the specific branch of Engineering pursued.
3. A course in Household Economics, leading to the degree of Bachelor of Science in Household Economics.
4. A course in Science, leading to the degree of Bachelor of Science.

ADVANCED DEGREES.

The advanced degrees, M. S., M. S. A., M. E., C. E., E. E., will be granted to Bachelors who shall have completed the corresponding undergraduate course herein outlined or its equivalent, on the satisfactory completion of one year of resident graduate work, the presentation of an acceptable thesis, and the passing of the required examinations. The equipment of the College and its environs afford excellent opportunity for research and the study of special problems.

For admission as candidate for advanced degree.

To be accepted as a candidate for an advanced degree, the applicant must be a graduate of the College of Hawaii or of some other college of equal standing. The application should be made in writing to the Committee on Advanced Degrees not later than October 1st, and should be accompanied by the applicant's diploma and a certified statement of the work done along the lines the applicant purposes to follow. In case the amount of undergraduate work is deemed insufficient, the applicant, if accepted, may be required to take other undergraduate courses, which will not be credited towards the advanced degree.

A matriculation fee of five dollars is required of all candidates for advanced degrees.

For receiving the degree.

General requirements.

The minimum requirement for the master's degree is the satisfactory pursuance of advanced work, under direction of a special committee, for at least one year at the College, or for at least two years *in absentia*. In addition, the candidate must meet the thesis requirements and pass the required examinations.

Nature of advanced work.

The advanced work may be restricted to one subject only, or to a major and one minor, or to a major and two minors; but at least one-half the work must be in the major, and the minors must be so correlated to the major as to satisfy the Committee on Advanced Degrees that the candidate is working with a definite purpose. For the present the work in the major subject must be largely if not wholly in line of original investigation, the results of which will form the subject matter of the thesis.

Nature of thesis.

The general subject of the thesis, together with the written approval of the chairman of the committee in charge, must be

furnished to the Committee on Advanced Degrees not later than December 1st of the year in which the degree is to be taken.

The completed thesis must be presented to the Committee on Advanced Degrees at least one week before the date set for the candidate's examination, and must win the Committee's approval as demonstrating the candidate's ability both to do original work and also to present the results of that work in creditable form. The thesis, accompanied by the written approval of the chairman of the Committee on Advanced Degrees, will be returned for use in the examination or for binding. Before the candidate is granted a diploma, a type-written copy of the thesis, on pages 8x10½ inches in size, substantially bound in stiff covers, and bearing the written approval of the professor in charge, must be deposited in the Library as the permanent property of the College.

Nature of examination.

The examination for the degree will be conducted by the committee in charge of the candidate's work, and may be either written or oral or both written and oral. It shall be open to all members of the Faculty. Requests for examinations should be made in writing to the Committee on Advanced Degrees not later than April 15th, and the Committee will announce the time and place of the examination not later than May 1st.

CREDITS.

The year's work is divided into two semesters of eighteen weeks each. Recognition of work done is given in terms of credits, a credit generally being the equivalent of two and one-half hours per week spent in the preparation and the recitation of a lesson, or in the field or laboratory. The exact division of this time, however, is generally left to the discretion of the professor in charge.

TUITION.

Tuition in the College is free to residents of the Territory. Non-residents will be given information in regard to tuition on application to the President.

COURSE IN AGRICULTURE.

The Course in Agriculture is designed to give the student an intimate knowledge of the fundamental principles which underlie agriculture as a science and a profession, and thus to equip the student for effective service either in practical farming, agricultural education, or research work. Broadly considered, agricultural science comprehends a wide range of subjects, and includes something from nearly every department of human learning. The natural sciences of geology, meteorology, chemistry, physics, botany, zoology, bacteriology and physiology are directly and intimately related to it. Not in the sciences alone should the agricultural student be broadly educated, but also in mathematics, languages, history, economics, and business methods. Accordingly, during the first two years the requirements of the course follow closely those laid down for the Course in Science.

The work of the last two years comprises for the most part the study of the subjects that pertain to the practice of agriculture. These are agronomy, or crop-production, including a study of soils, fertilizers and crops; animal husbandry in its various branches, including dairy technology; rural engineering; and farm management and rural economics. The student is not required to choose his major course of study until the beginning of his junior year. Electives are offered in his junior and senior years in order that the student may make his course more general or more technical, according to his individual needs.

By special permission of the faculty, students in any course may substitute equivalents for any of the subjects regularly prescribed.

EQUIPMENT.

Believing that practical demonstration and experimentation are of decided educational value in the study of scientific agriculture, the agricultural laboratories and college farm are being equipped with the best modern appliances. Students are encouraged and given every opportunity to avail themselves of appropriate practicums both in the field and in the laboratories.

LABORATORIES. The new main College building provides well-lighted and commodious laboratories for extensive collections of seeds and dried specimens of farm crops and other agricultural material, for the study of soil physics, pot cultures, etc., while

the laboratories for general physics, chemistry and biological subjects are likewise well equipped in this and other buildings. Wherever needed individual pieces of apparatus are provided for each student, such as microscopes, physiological apparatus, chemical and physical equipment, and plant material and products, farm tools and implements.

COLLEGE FARM. The College is now in possession of ninety acres of land. A large portion of this tract is well adapted to agricultural purposes, and will in large part be devoted to the college farm. Some thirty acres have already been under crops, and this portion forms the nucleus of the farm.

In 1910 a modern dairy building was erected. This is well supplied with machinery and conveniences for farm dairying, for handling market milk and the manufacture of creamery butter, besides serving as feeding and milking shed. At this time small but very select foundation herds of pure-bred registered dairy cattle were purchased, representing the Ayrshire, Guernsey and Holstein breeds. A well equipped poultry department has also been established, and other classes of live stock are to be added as means and needs warrant.

LIBRARY. The library contains a large number of volumes which pertain to Agriculture, and more than 7000 pamphlets and Bulletins of the Experiment Stations. The library is constantly receiving additions. Students are encouraged and required to make systematic use of the library in connection with their prescribed courses.

OUTLINE OF COURSE IN AGRICULTURE.

FIRST YEAR.

	Name of Course.	Credits 1st Sem.	Credits 2nd Sem.
English Composition	English 1 & 2....	3	3
French or German	Fr. or Ger. 1 & 2.	3	3
Mensuration and Trigonometry.	Math. 1	3	..
Advanced Algebra	Math. 2 .....	..	3
General Chemistry	Chem. 1 & 2	3	3
Botany	Bot. 1 & 2	3	3
Mechanical Drawing	M. D. 1	2	2

SECOND YEAR.

	Name of Course.	Credits 1st Sem.	Credits 2nd Sem.
English Literature	English 3 & 3b...	3	3
French or German	Fr. or Ger. 3 & 4.	3	3
General Physics	Physics 1	3	..
Qualitative Analysis	Chem. 4 & 4a	3	3
Zoology	Zoology 1	3	..
Entomology	Ent. 1 .....	..	3
Surveying	Civ. Eng. 1	2	2
Horticulture	Hort. 1 (or 3)...	..	3

THIRD YEAR.

Bacteriology	Botany 4	3	..
Soils and Soil Management	Agron. 1 & 2	3	3
Horticulture	Hort. 2 & 3 (or 1)	3	3
Crops and Farm Management..	Agron. 3 & 4	3	3
Breeds of Live Stock and Prin- ciples of Breeding	Animal H. 1 & 2.	3	3
Geology	Geology 1 .....	..	3
Organic Chemistry	Chem. 5 & 5a	3	3

FOURTH YEAR.

Economic History	Hist. & Econ. 1 & 2	3	3
Political Economy	Hist. & Econ. 3 & 4	3	3
Animal Nutrition and Stock Feeding	Animal H. 5 & 6.	3	3
Crops and Crop Improvement ..	Agron. 5	5	5
Electives	_____	4	4

COURSES IN ENGINEERING.

The Courses in Engineering are planned to give thorough training in the fundamental principles upon which professional engineering practice is based, and to illustrate the application of these principles by the solution of numerous practical problems. The courses embrace the three main divisions of engineering: mechanical, civil, and electrical, the essential features of each being touched upon sufficiently to provide a good foundation for future practice. For the first two years the prescribed work is the same for all students in engineering. At the beginning of the third year students in civil engineering commence their special subjects. Students taking either electrical or mechanical engineering have the same required work until the fourth year. All differences between the three lines of work are minimized as far as is consistent with thorough training and proper administration. Persons entering these courses are expected to be well prepared in the physical sciences and in mathematics up to and including solid geometry and plane trigonometry. (See Entrance Requirements pp. 18 and 19.) It is desired to emphasize the necessity of thorough preparation in order that the more serious work of mastering technical subjects may not be hampered by lack of proper ground work.

The general plan provides a broad foundation in English, mathematics, chemistry, and physics, accompanied by drawing and shop work during the first two years. Realizing the value of general culture to the successful engineer, liberal provision has been made for the Humanities, including a study of English, history, astronomy, and political economy, with a view to their influence upon the student's future professional usefulness. The work of the last two years is more technical and professional in its nature, embracing the study of the principles involved in power development by means of the various prime movers, including steam engines, water wheels, gas and gasoline engines, and steam turbines; and also a critical study of the design of such machines, and of the materials entering into their construction, as well as practical tests to determine their working efficiency and economy of operation. It is aimed to fit graduates to assume gradually, as practical experience is acquired, those administrative responsibilities which are more and more devolving

upon men of technical training, and to become ultimately skillful practical engineers. So far as possible, the importance of each subject covered is illustrated by the application to some work which is met with in actual practice. It is also intended that the courses should be valuable from an educational viewpoint; therefore, while the student is learning each subject both theoretically and practically, the training of his mind, as well as the needs of the profession, is kept in view.

DRAWING. The drafting room equipment includes a number of first-class adjustable tables and desks, fitted with all accessories, complete for work; also an extensive outfit for blue printing, and many special instruments, such as parallel attachments for tables, railroad curves, splines, protractors, planimeters, special scales, drafting machines, and computing instruments. The library of the College contains a special section on the general subject of mechanical drawing, which is accessible at all times for student use.

SHOP. The equipment for wood working and pattern making embraces ten pattern makers' benches, each equipped with a full complement of tools, for the regular use of the students, with many special tools for illustrative purposes; also a number of machine tools for wood working, including a band saw, scroll saw, grinding machine, universal saw bench, hand planer, surfacing planer, boring machine, universal trimmer, a number of small wood lathes, and a large pattern makers' lathe. The equipment is designed to conform to the best practice in such work, in that the machinery is arranged in groups, and is driven throughout by electric motors, thus giving the student correct ideas upon proper arrangement and operation.

The forge equipment is arranged on the down-draft plan, and embraces ten sets of forges and anvils, with complete outfits of tools, specially adapted to the work of instruction. The forges are served by a common pressure blower and a separate exhaust, each of which is operated by an individual electric motor drive.

TESTING LABORATORY. In connection with the wood working and forge laboratory, the College maintains a laboratory for testing materials of construction, including wood, iron, steel, and cement, and also provides facilities for fuel testing. The equip-

ment of the testing laboratory includes a 150,000 lb. capacity Reihlé universal testing machine, with automatic and autographic attachments, for tension, compression, and transverse tests of large specimens; a small Reihlé machine for testing specimens up to 10,000 lbs. in transverse strain; an Olsen torsion machine for torsion tests up to 50,000 in.-lbs.; a special Olsen machine of 40,000 lbs. capacity for compression tests of cement and concrete cubes; and a standard Reihlé 2000 lbs. machine for briquettes. These machines are provided with a complete assortment of the necessary special instruments, such as extensometers, compressometers, deflectometers and gauges, thus making possible the accurate measurement of deformation over a wide range of tests. In addition to the above, the testing laboratory also includes an extensive equipment of molds, sieves, Vicat needles, moist closets, drying ovens, and other minor accessories necessary to carry out practical tests of cements and concrete in any of the usual forms.

LIBRARY. Students in engineering are encouraged and required to make frequent and continuous use of the library in connection with the regular courses of instruction. The library contains a large and well selected collection of standard technical books, besides many periodicals pertaining especially to engineering. The collection includes sets of the Transactions and Proceedings of the four National Engineering Societies, together with bound volumes of the Engineering News back to and including the year 1890, which, taken together, constitute an excellent working library of current practice in each of the main branches of engineering.

MECHANICAL ENGINEERING.

The course in mechanical engineering is designed to afford training in general engineering, covering in addition thereto, the more purely mechanical subjects, exercises in electrical measurements and testing, in chemical technology, in hydraulics, in sugar engineering, and in the engineering of power plants. This general scope of subjects affords insight into actual industrial and engineering practice, and to this end the collateral training of the faculties is insured by courses in the laboratories, work shops, and the drafting room. In the drafting room the student learns

to make working drawings and blue prints of machine parts and engineering structures, and finally works out original designs. Instruction in the shops and laboratories gives familiarity with materials and mechanisms, skill in handling tools and appliances, an understanding of the practical possibilities of machinery and processes, and an acquaintance with shop and laboratory limitations affecting the principles of design and manufacture. The course thus embraces, in addition to theoretical training, the use of tools and the value of different methods of executing work from the standpoint of economic construction.

OUTLINE OF COURSE IN MECHANICAL ENGINEERING.

FIRST YEAR.

	Name of Course.	Credits 1st Sem.	Credits 2nd Sem.
English Composition	Eng. 1 & 2	3	3
French or German	Fr. or Ger. 1 & 2.	3	3
Algebra and Analy. Geom.....	Math. 3	5	..
Trig. and Calculus	Math. 4 .....	..	5
General Chemistry	Chem. 1 & 2	3	3
Mechanical Drawing	M. D. 1	2	2
Wood Technology	M. A. 1	2	2

SECOND YEAR.

English Literature	Eng. 3 & 3b	3	3
French or German	Fr. or Ger. 3 & 4.	3	3
General Physics	Phys. 1 & 2	3	2
Calculus	Math. 5 & 6	3	3
Surveying	C. E. 1	2	2
Mechanical Drawing	M. D. 2	2	..
Descriptive Geometry	M. D. 3 .....	..	3
Foundry Practice	M. A. 2 .....	..	2
Forging	M. A. 3	2	..

THIRD YEAR.

Analytical Mechanics	C. E. 2	4	..
Structural Mechanics	C. E. 3 .....	..	3
Metallurgy	M. E. 3 .....	..	2

		1st Sem.	2nd Sem.
Materials	M. E. 2	2	..
Kinematics	M. D. 4	2	..
Machine Design	M. D. 5 .....	..	3
Physics (Laboratory).....	Phys. 3 .....	..	3
Steam Machinery	M. E. 1	3	..
Electrical Machinery	E. E. 1 .....	..	3
Mechanical Laboratory	X. E. 1	2	2
Machine Work	M. A. 4	2	2
Chemistry (Qualitative Analy.)..	Chem. 4	3	..

FOURTH YEAR.

Thermodynamics	M. E. 4	3	..
Engines	M. E. 5 .....	..	3
Steam Engine Design	M. D. 7	2	..
Power Plant Design	M. E. 7 .....	..	2
Dynamo Laboratory	E. E. 3	2	..
Political Economy	Hist. & Econ. 4... ..	..	3
Hydraulics	C. E. 7	3	..
Engineering Laboratory	X. E. 2	2	..
Power Plant Testing	X. E. 3 .....	..	2
Specifications and Contracts	M. E. 8 .....	..	2
Engineering of Sugar Plants ...	M. E. 6 .....	..	2
Psychology	Psy. 1	3	..
Electives .....	.....	3	4

CIVIL ENGINEERING.

The College recognizes this branch of engineering as at once the oldest and broadest of the engineering professions, comprising, as it does: Municipal Engineering, with its problems of water supply, sewage disposal, and highway construction; Hydraulic Engineering, with its questions of irrigation and water power development; Structural Engineering, dealing with the design of bridges, steel, and concrete buildings, roofs, foundations, and retaining walls; and Transportation Engineering, including the building of railways, canals, docks, and tunnels. This wide range of subjects cannot be covered in detail in a four-year course, hence the student's attention is concentrated upon the comparatively few

principles underlying the various branches of the profession, and he is given every facility for mastering them by continuous drill in the class room and in the laboratory. He is taught that knowledge, when not accompanied by the ability to use it, is of small value, while accuracy and neatness in drawings and computations are an invaluable aid. The details and cost of construction are dwelt upon sufficiently to impress the student with their importance in the problems of design, with special regard to theory and economy.

OUTLINE OF COURSE IN CIVIL ENGINEERING.

THIRD YEAR.

		Credits 1st Sem.	Credits 2nd Sem.
Analytical Mechanics	C. E. 2	4	..
Structural Mechanics	C. E. 3 .....	..	4
Materials	M. E. 2	2	..
Metallurgy	M. E. 3 .....	..	2
Geology	Geol. 1 .....	..	3
Astronomy	Math. 7	3	..
Bacteriology	Botany 4	3	..
Surveying	C. E. 4	3	..
Material Laboratory	X. E. 4 .....	..	3
Topographical Drawing	M. D. 6 .....	..	3
Municipal Engineering	C. E. 9	3	3

FOURTH YEAR.

Hydraulics	C. E. 7	3	..
Hydraulic Constructions	C. E. 8 .....	..	3
Surveying	C. E. 10	3	3
Structural Design	C. E. 5	3	..
Bridge Design	C. E. 6 .....	..	3
Concrete and Masonry Struct's.	C. E. 12 .....	..	3
Political Economy	Hist. & Econ. 4...	..	3
Psychology	Psy. 1	3	..
Dendrology	Botany 3	2	..
Contracts and Specifications ...	M. E. 8 .....	..	2
Steam Machinery	M. E. 1	3	..
Electives .....	.....	1	1

ELECTRICAL ENGINEERING.

The course in electrical engineering is intended to give the training required by men who wish to take up, professionally, the applications of electricity to the useful arts, as in electric railways, telephones, electric lighting, electro-metallurgy, and the generation, transmission, and utilization of electric power. The large amount of laboratory work required aims to educate the student in accurate observation, proper order, and form in recording observations, the drawing of correct inferences, and the setting forth of his work in good English. Sufficient practice is given in the handling of dynamos and electrical machines and instruments to enable the student to carry out independently any tests or measurements likely to occur in actual practice. The importance of details is impressed upon him by the solution of numerous practical problems in constructive engineering and design, working drawings being required where necessary.

ELECTRICAL ENGINEERING.

FOURTH YEAR.

		Credits 1st Sem.	Credits 2nd Sem.
Thermodynamics	M. E. 4	3	..
Engines	M. E. 5 .....	..	3
Electric Machinery Design	E. E. 2	2	..
Power Plant Design.....	M. E. 7 .....	..	2
Engineering Laboratory	X. E. 2	2	..
Dynamo Laboratory.....	E. E. 3	2	..
Hydraulics	C. E. 7	3	..
Electro-Metallurgy	E. E. 4 .....	..	2
Power Plant Testing	X. E. 3 .....	..	2
Political Economy	Hist. & Econ. 4 ..	..	3
Psychology	Psy. 1	3	..
Electives .....	.....	3	6

COURSE IN HOUSEHOLD ECONOMICS.

There is an increasing appreciation of the fact that much that relates to the home may be studied scientifically, not only for the practical value of the knowledge thus gained, but as a means to a liberal education. While the work offered in this Course is mainly scientific and technical, the importance of an artistic and literary training for home life is not lost sight of, and ample opportunity is given for the study of cultural subjects in the electives and in the required work in the Humanities. The course thus allows opportunity for students to obtain training along both scientific and artistic lines. As the Course develops, new subjects will be incorporated.

DOMESTIC ART AND DESIGN. Recognizing the place of art training in the broad education now offered by the best institutions, the College has provided for well defined courses in Art and Design, with special reference to Ceramics.

These courses aim to enlarge the resources of the student along both practical and æsthetic lines. The men and women of to-day who are trained in the sciences of agriculture and mechanic arts live in close touch with nature. They require such training of the artistic sense as will enable them to appreciate and apply those principles of fitness, harmony, and proportion which are manifest in nature. Refinement of taste and a developed power of discrimination are especially helpful in the home. Hence the work in art is adapted to the requirements of students in Household Economics.

DOMESTIC SCIENCE. Without neglecting the importance of manual skill, the work in domestic science aims especially towards intellectual training and development. The problems of food, clothing, and shelter are given equal attention, and are treated both from a scientific and an artistic point of view.

EQUIPMENT. To carry on the courses in art and design, the College is well supplied with casts, models, and illustrative designs, and has a modern kiln for firing porcelain. Plans and charts pertaining to home architecture are being added to the collection of reference books in the library.

For work in domestic science there is a well equipped cooking laboratory and dining room, which facilitate instruction in the

preparation and serving of meals according to scientific and artistic methods. The kitchen range is fitted with a separate gas meter for measuring the consumption of gas in cooking. Fireless cookers, individual utensils, ovens, and apparatus are provided. The sewing department is equipped with machines, electric iron, a complement of forms, and other apparatus pertinent to this line of work.

OUTLINE OF COURSE IN HOUSEHOLD ECONOMICS.

FIRST YEAR.

		Credits 1st Sem.	Credits 2nd Sem.
Mensuration and Trigonometry.	Math. 1	3	..
Advanced Algebra	Math. 2	..	3
English Composition	Eng. 1 & 2	3	3
French or German	Fr. or Ger. 1 & 2.	3	3
General Chemistry	Chem. 1 & 2	3	3
Freehand Drawing	Art & Dsn. 1 & 2.	2	2
Botany	Botany 1	3	..
Physiology	Physiol. 1	..	3

SECOND YEAR.

Zoology	Zoology 1	3	..
English Literature	Eng. 3 & 3b	3	3
French or German	Fr. or Ger. 3 & 4	3	3
Qualitative Analysis	Chem. 4	3	..
Qualitative Analysis	Chem. 20	..	3
Color	Art & Dsn. 3 & 4.	2	2
Textiles	D. S. 1	3	3
Selection and Prep. of Food	D. S. 2	..	3

THIRD YEAR.

Bacteriology	Botany 4	3	..
Food Analysis	Chem. 21 & 14..	3	3
Entomology	Ent. 1	..	3
Selection and Prep. of Food...	D. S. 3	3	..
House Construction, Sanitation and Decoration	D. S. 4	..	3
Electives	—————	6	6

	Credits 1st Sem.	Credits 2nd Sem.
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FOURTH YEAR.

Economic History	Hst. & Econ. 1 & 2	3	3
Political Economy	Hst. & Econ. 3 & 4	3	3
Dietetics	D. S. 5 .....	..	3
Psychology	Psy. 1	3	..
Electives in H. E. Courses	_____	3	3
Electives	_____	3	3

COURSE IN SCIENCE.

The Course in Science is designed to meet the needs of those desiring a general training in scientific subjects. For the first two years the arrangement of subjects is practically the same as in the courses in Agriculture and in Household Economics. During the Junior and Senior years, in order to give the student sufficient training in some one science to enable him to follow it as a profession, and in order to meet a local need not met by the other courses, chemistry is given a prominent place. Enough chemistry is required thoroughly to acquaint the student with the essential branches of the subject. By a liberal number of elective credits, students who wish to supplement their chemical training with other sciences, mathematics and engineering subjects, and students who wish a more general training in languages and arts are all accommodated.

EQUIPMENT. The equipment for instruction in the sciences is extensive and modern. It includes for use in the biological sciences an excellent series of compound microscopes, microtomes, and complete histologic apparatus, a complete manikin, a skeleton, a set of physiological charts, and a number of dissecting microscopes fitted with camera lucida attachments.

For physics, in addition to the ordinary apparatus for lecture demonstrations and laboratory work, there is a complete X-ray apparatus and a lecture room wireless telegraph outfit. A six-inch telescope and a three-inch transit have been provided; also an adequate set of meteorological apparatus to supplement class room instruction in meteorology.

For chemistry, the laboratories are well equipped, and the student is furnished with all the supplies needed for his work. For more advanced work there are complete sets of apparatus for gas analysis and oil testing, a Lippich's half-shadow polariscope for 400 mm. tubes, with latest form Landholt's adjustable control tube, and a Rueprecht chemical balance, besides student balances, platinum ware, blast and suction apparatus, and other conveniences for advanced analytical work.

For use in all departments there is a photographic dark room fully equipped, an enlarging and reducing outfit, a panoramic and a telescopic camera, besides small cameras for field work, and several stereopticons.

The library contains a large number of the best and latest books on the different sciences. New books are constantly being added, and complete sets of bound volumes of periodicals will be purchased as fast as they are needed and can be found in the market.

OUTLINE OF COURSE IN SCIENCE.

FIRST YEAR.

	Name of Course.	Credits 1st Sem.	Credits 2nd Sem.
Mensuration and Trigonometry.	Math. 1	3	..
Advanced Algebra	Math. 2 .....	..	3
English Composition	English 1 & 2 ...	3	3
French or German	Fr. or Ger. 1 & 2	3	3
Botany	Botany 1 & 2 ...	3	3
General Chemistry	Chem. 1 & 2	3	3
Mechanical Drawing	M. D. 1	2	2

SECOND YEAR.

English Literature	Eng. 3 & 3b	3	3
French or German	Fr. or Ger. 3 & 4.	3	3
Theoretical Chemistry	Chem. 3	2	..
Qualitative Analysis	Chem. 4 & 4a ...	3	3
Physics	Physics 1 & 2 ...	3	2
Zoology	Zoology 1	3	..
Entomology	Entom. 1 .....	..	3
Electives	_____	..	3

THIRD YEAR.

Bacteriology	Botany 4	3	..
Organic Chemistry	Chem. 5, 5a & 6..	4	4
Quantitative Analysis	Chem. 10 & 12 ...	3	3
Geology	Geology 1 .....	..	3
Electives	_____	5	5

FOURTH YEAR.

History of Economics	Hst. & Econ. 1 & 2	3	3
Political Economy	Hst. & Econ. 3 & 4	3	3
Industrial Chemistry	Chem. 7 & 8	6	..
Chemical Literature	Chem. 15 & 17 ...	1	1
Chemical Research	Chem. 18 .....	..	5
Electives	_____	2	3

SUBJECTS OF INSTRUCTION.

*(Arranged in Alphabetical Order.)***AGRICULTURE.****AGRONOMY.**

The courses in agronomy are designed to acquaint the student with the fundamental principles and practices of soil management and crop production, and in farm management, which is the practical application of all the facts, principles and sciences related to agriculture. Lectures and recitations are supplemented by laboratory and field studies on soils, fertilizers, and crops, and the influences of their environments. Particular stress is laid upon practicums which enable the student to make personal observations and deductions from a study of the things themselves.

Advanced work in agronomy, consisting in research work upon one or more important Hawaiian crops, will be offered to students who have completed courses 1-4, and have had sufficient work in applied agriculture to be able to undertake field experiments. A summer practicum, consisting of farm practice and experimental work in plant production, will be offered to students who may care to avail themselves of a brief, uninterrupted course in applied agriculture. Practicum 100 hours by appointment during summer vacation, 3 credits.

1. **AGRICULTURAL SOILS.** Lectures, recitations, and laboratory work. A general course, designed to cover a systematic study of farm soils in relation to their origin, formation, classification, and properties. Based on Hilgard's "Soils," and Publications of the Bureau of Soils, U. S. Department of Agriculture. 1st semester, 3 credits. *Professor Krauss.*

2. **SOIL MANAGEMENT.** Lectures, recitations, and field practicum on the principles and practices of soil management, with particular reference to crop production. Based on Lyon and Fippin's "Principles of Soil Management" and other standard texts. 2nd semester, 3 credits. *Professor Krauss.*

3. **AGRICULTURAL CROPS.** Lectures and recitations on the

classification, history, and marketing of farm crops, together with laboratory and field studies on the fundamental principles and practices of crop production. Based on Hunt's "Cereals in America," Experiment Station literature, and Publications of the U. S. Department of Agriculture. 1st semester, 3 credits.

Professor Krauss.

4. AGRICULTURAL CROPS AND FARM MANAGEMENT. Lectures, recitations, and laboratory and field work on forage, fiber, and special crops, particularly those adapted to the climate, soils, and uses of Hawaii. The course covers the study of soil and climatic adaption, the principles of production, harvesting, and preparation for use or market. Studies in agricultural methods in the United States and other countries, as well as in Hawaii, as related to farm practices, cost and relative profits of various crops and cropping systems, together with a study of such pertinent questions as choosing a farm, plotting the farm, farm equipment, irrigation, and drainage, maintenance of fertility and its further improvement by stocking, marketing, records, and farm accounts, etc., are given due consideration. All available literature will be used for reference. Hunt's "Forage and Fiber Crops," Duggar's "Southern Field Crops," and Deere's "Cane Sugar;" "How to Choose a Farm," Hunt; and numerous references in the publications of the U. S. Department of Agriculture will form the major portion of the text. 2nd semester, 3 credits.

Professor Krauss.

5. CROP IMPROVEMENT. A careful study of the literature on plant breeding, supplemented by field and laboratory work in making comparative tests, selections, and crossings of some Hawaiian crops, with a view to their improvement. During the present year extensive breeding work is being carried on with field corn, alfalfa and sweet potatoes, offering the student exceptional opportunity for the application of scientific principles. Prerequisites: Agronomy 3 & 4, and at least one summer's practicum or its equivalent. Throughout the year, by appointment, 3 credits for each semester.

Professor Krauss.

6. RURAL ECONOMY. Lectures and recitations treating of the production, preservation, and distribution of wealth by the use of land for the growing of plants and animals. It may include the development of agriculture as a business (history of

agriculture), as well as facts and principles of farm management under present conditions. 2 semesters, 2 credits each.

Professor Gilmore.

ANIMAL HUSBANDRY.

The courses in animal husbandry deal with the most economic production of farm animals, including horses, cattle, sheep, swine, goats, poultry, and other specialized lines of animal industry. The student is taught the characteristics of the various breeds of live stock and the types of animals which are best adapted to any given line of production, whether it be for meat, milk, wool, eggs, or for work. Instruction is given in stock selection, breeding, feeding, care and management, and in the use of herdbooks and other live stock records. In addition to the lectures, recitations, and the practice given in the courses, students are encouraged and required to make systematic use of the library for the courses of study. When the student has become sufficiently mature, he is urged to take up some line of investigational work and apply some of the knowledge and methods which he has acquired during his course.

1. BREEDS OF LIVE STOCK AND PRINCIPLES OF BREEDING. Lectures and recitations on the history and characteristics of the different breeds of live stock, together with practice in scoring and judging animals for special uses. Students are taught to make close and detailed observations of animal form and to conceive an ideal of animal perfection in the types and breeds which are the most suitable for the several lines of animal industry. The principles and practices concerned in the improvement of the various classes of domestic animals. Special attention is given to variation, heredity, prepotency, fecundity, development of the animal body, in-and-in breeding, cross breeding, grading up, and to a history of the results. The life and works of some of the noted scientists will be given a brief review. 1st semester, 3 credits.

Mr. Clark.

2. BREEDS OF LIVE STOCK AND PRINCIPLES OF BREEDING. (Continuation of Course 1.) 2nd semester, 3 credits.

Mr. Clark.

3. DAIRYING. A study of text-books, lectures, and practice. Practice will be given at the new dairy barn in milk testing, cream

separation, butter making, and in market preparations. 1st semester, 3 credits.

Mr. Clark.

4. **POULTRY KEEPING.** Lectures, recitations, and practice at the poultry yards. Special attention will be given to the profitable production of meat and eggs. During the first part of January, and previous to the annual poultry show, a short course in the scoring and judging of fowls for market and show purposes will be given. This short course is open to anyone who wishes to come and will show his interest by doing diligent and faithful work. The regular course is given throughout the year. 1st and 2nd semesters, 3 credits.

Mr. Clark.

5. **ANIMAL NUTRITION AND STOCK FEEDING.** The principles of nutrition, feeding stuffs, and methods of calculating rations which are well adapted to the various classes of live stock, together with a study of the physiology of domestic animals. 1st semester, 3 credits.

Mr. Clark.

6. **LIVE STOCK MANAGEMENT.** The formation of dairy herds under different systems of management, stabling, breeding, and marketing. Horses, sheep, and beef cattle, and their management. 2nd semester, 2 credits.

Mr. Clark.

7. **RESEARCH WORK.** Research work may be elected along any one of the various lines of animal husbandry, but opportunities are especially good for work in lines pertaining to dairying and poultry culture. Seniors, especially, are encouraged to take up investigational work in the preparation of a thesis. The nature of the subject and the time spent will determine the number of credits allowed.

HORTICULTURE.

1. **PLANT PROPAGATION.** The principles of plant production and the methods most applicable to the important fruits, flowers, and vegetables of Hawaii. Soil, moisture, and temperature conditions as factors in plant health. Methods of disinfecting seeds and stock; fumigation of green-houses. Laboratory exercises in seed selection and testing, care and planting of seeds, separation, division, layering, cuttage, budding, and grafting. Occasional excursions to orchards, nurseries, and similar localities. Raising plants in pots, flats, frames, and open beds. Forcing,

checking, and shaping plants. Text: Bailey, "Nursery Book."
1st semester, 3 credits. *Professor MacCaughey.*

2. PLANT PROPAGATION. A continuation of Course 1. Special studies in plant selection and breeding. Practice in pollination, hybridization, and selection methods. Technical methods used in the propagation of special groups of plants, as ferns, orchids, etc. Students registering for this course are requested to care for a specified number of plants in the nursery. The aim of this course (1 and 2) is to give technical knowledge and skill in the standard horticultural methods of plant propagation. Laboratory fee \$1.00. 2nd semester, 3 credits.

Professor MacCaughey.

3. PRINCIPLES OF HORTICULTURE. The principles of horticulture, the fundamental methods of fruit growing, vegetable gardening, floriculture, and landscape gardening, utilization of horticultural products, comparative surveys of typical horticultural regions of the world, tillage, irrigation, drainage, and fertilization of horticultural lands. Laboratory work includes studies of important fruit, vegetable, and flower types; scoring; work with horticultural soils, fertilizers, and spray mixtures; horticultural tools; the planning of horticultural enterprises, gardens, orchards, etc.; plant diseases and insect pests. Books used: Macmillan, "Handbook of Tropical Gardening;" Woodrow, "Gardening in the Tropics;" Bailey, "Cyclopedia of American Horticulture." 1st semester, 3 credits.

Professor MacCaughey.

4. FIELD WORK IN HORTICULTURE. A continuation and application of Course 3. The course consists of field work and excursions to typical horticultural enterprises. These enterprises are studied in detail from the standpoint of technical methods employed, business management, transportation and marketing of crops. Students registering for this course must have available one full day each week. No fee is charged; railroad and other transportation charges amount to about \$5.00. 2nd semester, 3 credits.

Professor MacCaughey.

5. TROPICAL AND SUB-TROPICAL FRUITS. A study of important fruits,—description, distribution, varieties, propagation, planting, culture, fertilizing, spraying, harvesting, grading, packing, marketing, and other commercial aspects. The amelioration of

existing fruit-types, and the production of new varieties. Surveys of large fruit regions. General studies of fruit protection, processing, preservation, utilization of wastes. The preparation and application of standard spray mixtures. Excursions to fruit farms, orchards, canning factories, warehouses, etc. Text: Bailey, "Principles of Fruit Growing." 2nd semester, 3 credits.

Professor MacCaughey.

6. **DESCRIPTIVE POMOLOGY.** The principles and methods of descriptive pomology, particularly as applied to tropical and sub-tropical fruits. Detailed studies of the following fruits: orange, lemon, pomelo, lime, the bananas, avocado, mango, papaya, pineapple, fig, grape, custard-apples, eugenias, breadfruit, tropical nuts. The more important temperate zone fruits are also considered. Discussions, laboratory and field work. Text: Wickson, "Fruits of California." Prerequisite: Hort. 5. Laboratory fee \$3.00. 2nd semester, 3 credits.

Professor MacCaughey.

7. **OLERICULTURE.** A laboratory course in the raising of vegetables. Classification, propagation, and cultural methods, enemy-control measures, and marketing of important vegetable types; special consideration of local conditions. Text: Bailey, "Principles of Vegetable Gardening." 1st semester, 1 or 2 credits. Open only to Juniors and Seniors who have taken Horticulture 1 and 2.

Mr. _____

8. **FLORICULTURE.** A laboratory course in the cultural methods for flowers, ferns, orchids, vines, and other ornamentals; taxonomic studies of important species and horticultural varieties; life histories of and control measures for fungus and insect pests; the construction and management of conservatories and fern houses; bedding and border planting; planning the flower garden; utilization of small areas. 2nd semester, 1 or 2 credits. Open only to Juniors and Seniors who have taken Horticulture 1 and 2.

Mr. _____

9. **RESEARCH IN HORTICULTURE.** The study of original problems from the standpoint of local conditions. Open only to students who have demonstrated ability. Prerequisites: Hort. 1, 2, 3, 4. Throughout the year, 3 or more credits.

Mr. _____

(For courses related to Horticulture, see courses in Botany.)

ENGINEERING.

MECHANIC ARTS (M. A.).

1. **WOOD TECHNOLOGY.** Woodworking, comprising the different operations of planing, rabbeting, plowing, notching, splicing, mortising, framing, dove-tailing, laying out work, and the general use of carpenters' tools, followed by practice in wood turning with special reference to manufacturing operations, and the construction of patterns for foundry work. Practice in the use of woodworking machinery as aid to rapid and accurate work. Instruction by lectures at the beginning of the periods, followed by work under the supervision of the instructor. Freshmen. Laboratory fee \$3.00 per semester. 2 semesters, 2 credits each.

Mr. McTaggart.

2. **FOUNDRY PRACTICE.** Includes various operations of molding, core making, and the melting and pouring of iron and brass, supplemented by lectures on special processes, machine molding, and general foundry practice. Prerequisites: M. A. 1, and M. D. 1. Sophomores. 2nd semester, 2 credits.

Mr. McTaggart.

3. **FORGING.** Includes upsetting, swaging, punching, bending, drawing out, forming, and welding. Practice in the working and tempering of the various kinds of steel, with special reference to their use for cutting tools for wood and metal working. Each student is required to forge and temper a complete set of chisels and lathe tools for his own use in the machine shop. Prerequisites: M. A. 1, and M. D. 1. Sophomores. 1st semester, 2 credits. Laboratory fee \$2.00.

Mr. McTaggart.

4. **MACHINE WORK.** Includes vise work, filing, chipping, drilling, tapping, key-seating, laying out work from dimensioned drawings, and hand work on machine tools, followed by work on lathe, planer, drill press, milling machine, and universal grinder, involving such operations as cylinder boring, gear cutting, the making of taps and reamers, and the machining of special machine parts in iron and steel, instruction in the use of jigs and templates, and in methods for rapid and economical production of work. Prerequisites: M. A. 2 and 3, M. D. 2. Mech. & Elect. Engrs. 2 semesters, 2 credits each. Laboratory fee \$3.00 per semester.

Mr. _____

DRAWING AND MACHINE DESIGN (M. D.).

1. MECHANICAL AND FREEHAND DRAWING. Elementary drafting, which includes freehand sketching, freehand lettering, use of instruments, conventional sections, drawing from copies and models (using parts of machines from the mechanical laboratory as models), the making of shop drawings, tinting and shading, tracing, and blue-printing; in which particular attention is given to lettering, general neatness, and accuracy. Text: Jamieson's "Elements of Mechanical Drawing." The cost of materials and instruments required is about \$40.00. Freshmen. 2 semesters, 2 credits each. *Professor Young.*

2. MECHANICAL DRAWING. Advanced drafting, following M. D. 1, covering the drawing of machine parts and complete machines to scale, and the design of machine details. Text: Jamieson's "Advanced Mechanical Drawing." Prerequisites: M. D. 1, and Math. 3 & 4. Sophomores. 1st semester, 2 credits. *Professor Young.*

3. DRAWING AND DESCRIPTIVE GEOMETRY. Descriptive geometry, with special reference to its application to practical work in the drawing office, embracing lectures and drawing room practice in which a large number of problems of a practical nature are worked out. Prerequisites: M. D. 2, and Math. 3 & 4. Sophomores. 2nd semester, 3 credits. *Professor Keller.*

4. KINEMATICS. The velocity ratios of various motions, the construction of gears, cams, quick-return motions, and the design of trains of mechanism. Special attention is paid to methods of calculation, and the use of computing devices, as an aid to rapid work. Lectures and drawing room exercises. Prerequisites: M. D. 2, and Math. 5 & 6. Junior Mech. & Elect. Engineers. 1st semester, 2 credits. *Professor Young.*

5. MACHINE DESIGN. Class room and drafting room work, covering the calculation of strength and stress, the principles of design of machine parts; the general features involved in the arrangement of conveying and transmission systems, the computation of machine details, unit working stresses, and the relation of design to shop possibilities and shop practice.

Each student is assigned problems for actual computation from the principles of this and preceding courses. Solutions of prob-

lems must be comprehensive, with view to strength of parts, adjustment, accessibility, cost of maintenance, appearance, cost of production, and interchangeability. All proportions must be determined from the fundamental principles involved. Text: Unwin's "Machine Design," Parts I and II. Prerequisite: M. D. 4. Junior Mech. & Elect. Engrs. 2nd semester, 3 credits.

Professor Young.

6. TOPOGRAPHICAL DRAWING. The use of topographical signs and conventions, hill shading by different methods, the representation of surface forms by contour and by the use of color, pencil, and charcoal; the making of topographic maps, copying, enlarging, and reducing maps. Includes also practice with special labor-saving devices, such as planimeters, pantographs, splines, curves, and drafting machines. Prerequisites: M. D. 2, and Math. 5 & 6. Junior Civil Engr. 2nd semester, 3 credits. (Alternates with course C. E. 10, and will not be given in 1913-1914.)

Professor Keller.

7. STEAM ENGINE DESIGN. Exercises in the drafting room, supplemented by lectures and library reference, covering the calculation and design, together with complete assembly and detail drawings of a steam engine for a given power and specified service. Prerequisites: M. D. 5, C. E. 2 & 3. Should be taken with M. E. 4. Senior Mech. Engrs. 1st semester, 2 credits.

Mr. —————.

MECHANICAL ENGINEERING (M. E.).

1. STEAM MACHINERY. The fundamental laws governing the transformation of heat into work, embracing the properties of gases, laws of expansion, heat measurement, the mechanical equivalent of heat, properties of steam, construction and study of steam tables, and heat analysis as applied to steam and internal combustion engines. The solution of a large number of problems of a practical nature is required. Lectures and recitations. Prerequisites: Math. 5 & 6, M. D. 2. Junior Mech. & Electrical Engineers and Senior Civil Engineers. 1st semester, 3 credits.

Professor Young.

2. MATERIALS OF ENGINEERING. Lectures and recitations on the properties and requirements for materials used in engineering construction, including wood, iron, steel, and concrete. Meth-

ods of manufacture as affecting quality of material, standard tests employed to secure the proper grades of material, and standard specifications. Prerequisites: Math. 5 & 6, M. D. 2. Juniors. 1st semester, 2 credits. *Professor Young.*

3. METALLURGY. General metallurgy, covering all the common metals, the processes and methods of reducing the metals from their ores, and methods of refining. The manufacture of iron and steel is given special attention. Prerequisites: M. E. 2, C. E. 2. Juniors. 2nd semester, 2 credits. *Professor Young.*

4. THERMODYNAMICS. The principles of thermodynamics as applied to the study of heat motors and steam machinery; involving the behavior of steam in the cylinder, compression, clearance, cylinder condensation, re-evaporation, jacketing, superheating, ratio of expansion, indicator diagrams and analysis, combined diagrams from multiple expansion engines, mechanical efficiency, proportions for compound engines, cylinder ratios, distribution of work, drop in receivers, reheating, and the calculations for the complete design of an engine for stated conditions. (Follows M. E. 1, and may be done in connection with the course in Steam Engine Design, M. D. 7, in such a way as to combine calculations and avoid duplication of work.) The lectures include methods of lubrication, valves and valve gears, link motions, valve diagrams, analysis of crank effort, counter-balancing, friction and inertia effects, methods of testing efficiencies, shop practice in assembly and erection, commercial types, and standard forms for power plant and mill work. Prerequisites: M. E. 1, C. E. 2 & 3. Senior Mech. & Elect. Engrs. 1st semester, 3 credits. *Professor Young.*

5. STEAM, GAS, AND OIL ENGINES. Special types of steam engines and steam turbines; internal combustion engines, and details pertaining thereto, as follows: fuel gases and fuel oils, their physical properties and calorific values; the various gases suitable for power, and methods of producing them; the gas engine cycle, and the historical development of internal combustion engines, gas and gasoline engines; limitations of efficiency, indicator diagrams, gas engine auxiliaries, and applications of gas power; mechanisms for control of air, ignition, and regulation; the use of alcohol for power, modern types of engines, problems in design, methods of cooling, valves and valve gears,

and efficiency tests: followed by discussion of special applications; the automobile engine, arrangement of cylinders, actual capacity, carburetors, transmission gears, the driving of electric generators; general economic considerations, influence of cost of fuel and plant cost on choice of prime movers; comparison of reciprocating, turbine and gas power plants. Prerequisite: M. E. 4. Senior Mech. & Elect. Engrs. 2nd semester, 3 credits.

Mr. _____.

6. ENGINEERING OF SUGAR PLANTS. Lectures and drafting room exercises, involving the application of the fundamental principles of engineering practice to modern sugar works, including grinding and evaporating machinery, boiler and engine plant, conveying machinery, industrial railways, arrangement of buildings, layout of plant, and other general and special engineering considerations affecting the making and refining of sugar. Prerequisite: M. E. 4. Senior Mech. Engrs. 2nd semester, 2 credits.

Mr. _____.

7. STEAM PLANT DESIGN. Lectures and drafting exercises on steam power generating machinery, with reference to plant design, touching upon such considerations as location of plant with respect to fuel and water supply, influence of load factor and first cost upon design; fuels, their properties and analysis, theory of combustion, stoking, steam boiler economy, types of boilers and calculation of capacity, design of boiler settings, furnaces for special fuels, oil burning, smokeless combustion, mechanical stokers, boiler fittings, draft and air supply, chimneys, forms of forced draft equipment, superheaters, economizers, feed pumps, injectors, feed water heaters, condensers; steam, exhaust, and water piping systems; pipe covering, water purification, coal handling and storage, plant economy, cost of power, specifications for fuel, operation of plants, care of steam boilers, and the general relations of power plant design to electrical engineering practice. Prerequisite: M. E. 4. Senior Mech. & Elect. Engrs. 2nd semester, 2 credits.

Professor Young.

8. CONTRACTS AND SPECIFICATIONS. Lectures on contracts, touching upon points likely to be of value to engineers, together with such principles of law as should be understood by the engineer who is entrusted with the drawing of contracts, followed by a detailed study of typical contracts and specifications for en-

gineering work of various kinds. Prerequisites: M. E. 4, or C. E. 7. Text: Tucker's "Contracts in Engineering." Senior Mechanical and Civil Engineers. 2nd semester, 2 credits.

Professor Keller.

ENGINEERING LABORATORY (X. E.).

1. MECHANICAL LABORATORY. Lectures and laboratory practice, the lectures covering the general method of measurement and testing, methods of recording data and computing results, forms for reports, factors affecting efficiency, and the equipment required for various physical tests; laboratory practice, including the use of engineers' computing devices; the ordinary slide rule, the Fuller spiral rule, the Thatcher rule, and Goodchild chart, the calibration of gauges, thermometers, scales, and indicator springs; the testing of lubricants, indicator and planimeter practice, tension, compression, and transverse tests of iron and steel; the calorimetric determination of heating value of fuels, tests of steam calorimeters, dynamometer tests, hydraulic ram and water meter tests, water wheel tests, and the efficiency of steam boiler and simple steam engine. Prerequisites: M. A. 2 & 3, Math. 5 & 6, M. D. 2. Junior Mech. & Elect. Engrs. 2 semesters, 2 credits each. Laboratory fee \$2.50 per semester. *Professor Keller.*

2. ENGINEERING LABORATORY. Lectures and laboratory practice following X. E. 1, and consisting of economy tests of boilers, engines, blowers, and transmission gearing; valve setting, injector tests, determination of heat loss in piping system, combined cards from multiple expansion engines; specific heats of brines, heat transfer through submerged coils, test of an ice making plant, road test of a locomotive, and similar exercises as opportunity may arise. The student records his observations in a notebook in the laboratory, and later submits computation and descriptive test in the form of a written report, accompanied by graphical logs, curves, and tabulations of data and results, with the conclusion arrived at. Prerequisites: X. E. 1, M. D. 5, C. E. 2 & 3. Senior Mech. & Elect. Engrs. 1st semester, 2 credits. Laboratory fee \$2.50. *Professor Young.*

3. POWER PLANT TESTING. Lectures on the general features of plant testing, illustrating the proper methods to be followed in given tests for plant economy, accompanied by actual tests of

electric power installations in or near the city of Honolulu. Such tests involve the accurate measurement of fuel and water consumed, with measurements of the output, from which the efficiency of the plant is determined. All results are presented in the form of a written report, containing log, computations, curves, and conclusions. Prerequisite: X. E. 2. Senior Mech. & Elect. Engrs. 2nd semester, 2 credits. *Mr. _____.*

4. MATERIALS LABORATORY. Laboratory practice in testing the materials of construction, involving complete tests of specimens of wood, iron, steel, and concrete in their various forms. Special attention is given to the preparation and testing of specimens of concrete, both plain and reinforced, in the form of cubes, columns, beams, and girders. The facilities available for such work are ample, and the instruction given covers a large number of practical tests, thus affording the student valuable means of familiarizing himself with the behavior of such materials under stress. Prerequisites: C. E. 2, 3 & 5. Junior Civil Engrs. 2nd semester, 3 credits. Laboratory fee \$3.00. *Professor Keller.*

ELECTRICAL ENGINEERING (E. E.).

1. ELECTRICAL MACHINERY. The fundamental principles governing the design and operation of dynamo-electrical machinery, and the theory and construction of armatures, field magnets, and commutators of direct current generators, motors, motor-generators, boosters, and regulators, followed by a brief treatment of alternating current machines, transformers, and transmission systems. Methods of calculation, graphical analysis, and the solution of practical problems are emphasized. Should be taken with Physics 3. Prerequisites: Math. 5 & 6, Physics 1 & 2, M. E. 1. Junior Mech. & Elect. Engrs. 2nd semester, 3 credits.

Professor Young.

2. ELECTRICAL MACHINERY DESIGN. Lectures and drafting exercises, following E. E. 1, treating of the principles of alternating and direct current machinery, and of their application to problems in design, embracing dynamos, motors, transformers, and transmission systems. Prerequisites: E. E. 1, C. E. 2 & 3. Senior Elect. Engrs. 1st semester, 2 credits. *Mr. _____.*

3. DYNAMO LABORATORY. Laboratory practice, involving the handling and testing of dynamos, motors, alternators, transform-

ers, storage batteries, and other electrical machinery, and covering a wide range of experiments along practical lines. Prerequisites: E. E. 1, C. E. 2 & 3. Senior Elect. Engrs. 1st semester, 2 credits. Laboratory fee \$2.00. *Professor Young.*

4. ELECTROCHEMISTRY AND METALLURGY. The principles of physical chemistry, so far as applicable in the electrolytic extraction and refining of metals, the electrolytic manufacture of chemical compounds, and the theory and practice of storage cells. Lectures and laboratory practice. Prerequisites: Chem. 11, Math. 5 & 6, E. E. 1. Senior Elect. Engrs. 2nd semester, 2 credits.

Mr. _____.

CIVIL ENGINEERING (C. E.).

1. SURVEYING. Plane surveying, supplemented by lectures and drafting room exercises. The use of the chain, tape, compass, transit, and level, and practice in the manipulation of these instruments in the field. The drafting room work includes practice in the computations that the surveyor is called upon to make, and plotting from original notes. Texts: Tracy, "Plane Surveying," and Breed and Hosmer's "Principles and Practice of Surveying," Vol. I. Prerequisites: M. D. 1, Math. 1 & 2, or 3 & 4. Sophomores in Engineering and Agriculture. 2 semesters, 2 credits each. Laboratory fee \$2.50 per semester.

Mr. _____.

2. ANALYTICAL AND APPLIED MECHANICS. The fundamental principles of the various branches of applied mechanics, and the use of higher mathematics in the solution of problems relating to engineering work. Includes the study of analytical statics, composition and resolution of forces, application to rigid bodies, centers of gravity, centers of mass, friction, work, flexible cords, funicular polygon, the catenary, and loaded chords, together with a large number of problems to illustrate special and general methods of solution. The analytical theory of kinetics is developed, and special attention is given to the laws of motion, variable forces, constrained motion, central forces, impact, energy, dynamics of prime movers, moments of inertia, rotary motion, and the simple and compound pendulum. Text: Church's "Mechanics of Engineering." Prerequisites: Math. 5 & 6, M. D. 2. Juniors. 1st semester, 4 credits.

Professor Keller.

3. **STRUCTURAL MECHANICS.** The resistance and elasticity of materials in tension, compression, and shearing stress, and the study and calculation of riveted joints, simple beams, cantilevers, restrained beams, safe loads, elastic curves, deflections, beams of uniform strength, columns, temperature stresses, and horizontal shear in beams, together with the solution of numerous practical problems. Text: Merriman's "Mechanics of Materials." Pre-requisite: C. E. 2. Juniors. 2nd semester, 4 credits, (or, omitting reinforced concrete, 3 credits.) *Professor Keller.*

4. **SURVEYING.** Recitation and field work, covering the various methods of making topographical surveys, including the theory and use of the plane table, stadia, sextant, and solar attachment to the transit. Students are required to make and reduce observations illustrating the methods of base line measurement, triangulation, and precise leveling. Text: Breed and Hosmer's "Principles and Practice of Surveying," Vol. II. Prerequisites: Math. 5 and 6, and C. E. 1. Junior Civil Engineers. 1st semester, 3 credits. (Alternates with C. E. 10, and will not be given in 1913-1914.) Laboratory fee \$2.50. *Professor Keller.*

5. **STRUCTURAL DESIGN.** Lectures and drafting exercises, in which the student computes the stresses and designs the members for a plate girder bridge, and a steel building truss. Includes the making of complete detail drawings and specifications, done under close supervision and carefully checked. The important general points are covered by lectures, minor points being taken up with individual students during the progress of the work. Text: Merriman and Jacoby's "Roofs and Bridges," Parts I and II. Prerequisite: C. E. 3. Senior Civil Engrs. 1st semester, 3 credits. *Professor Young.*

6. **BRIDGE DESIGN.** Lectures and drafting exercises following C. E. 5 and covering the complete design of a single track through bridge for a given conventional loading, and including all computation, the making of complete engineers' drawings, and the specifications. Text: Merriman and Jacoby's "Roofs and Bridges," Parts II and III. Senior Civil Engineers. 2nd semester, 3 credits. *Professor Young.*

7. **HYDRAULICS.** Lectures and recitations covering the more important principles of hydraulics which govern and treat of fluids at rest, hydrostatic pressure, manometers, and Pitot tube,

venturi meter, strength of pipes, pressure of water against walls and dams, earth pressure, barometric leveling, flow of liquids through pipes and over weirs, fluid friction, loss of head, flow of water in open channels, Kutter's formula, impulse and resistance of fluids, the Pelton water wheel, overshot, breast and undershot wheels; turbines and reaction wheels, and the general practice of turbine testing. The laboratory practice includes the gauging and measurement of flow in channels and over weirs, tests of water motors of various types, tests of hydraulic rams, and pumping machinery of various kinds. Text: Hughes and Safford's "Hydraulics." Prerequisites: C. E. 2 and 3. Senior Civil, Mechanical, and Electrical Engineers. 1st semester, 3 credits. (Alternates with C. E. 9, and will be given in 1913-1914.)
Professor Keller.

8. HYDRAULIC CONSTRUCTION. Lectures, recitations and reports covering the more important hydraulic constructions. The work is divided into three parts, as follows: water storage, including reservoir capacity, available sources of supply, the design of spillways and flood channels; irrigation engineering, including methods of distribution, construction of flumes, tunnels and ditches, and also touching upon the agricultural problems involved; harbor engineering, including a study of various types of wharves, methods of dredging, and harbor improvement. Prerequisites: C. E. 2, 3 and 7. Senior Civil Engineers. 2nd semester, 3 credits. (Alternates with C. E. 9, and will be given in 1913-1914.)
Professor Keller.

9. MUNICIPAL ENGINEERING. Lectures and recitations, including the general principles and methods of construction and cost of earth, macadam, and gravel roads; various kinds of pavements; sidewalks; city ordinances and regulations covering construction; civic art; city water supply; waterworks, and fire protection; the methods of sewage and garbage disposal; the hydraulics of sewers; the relation of rainfall to storm flow. Part of the course is devoted to municipal transportation problems now handled by the various public service commissions. Texts: Baker's "Roads and Pavements," Turneure and Russell's "Public Water Supply," Kinnicutt, Winslow and Pratt's "Sewage Disposal," Folwell's "Sewerage," Robinson's "Civic Art," and Engineering Periodicals and U. S. Gov't. Reports.

Junior Civil Engrs. 2 semesters, 3 credits each. (Alternates with C. E. 7, and C. E. 8, and will not be given in 1913-1914.)

Professor Keller.

10. **SURVEYING.** Railroad surveying, construction and economics. Field work and recitations, covering the methods of establishing grade lines, laying out circular and transition curves, the reconnoissance, preliminary, and location surveys for a railroad; earth work computation, maps, profiles, plans of structures, and estimates. Prerequisites: C. E. 1, Math. 5 & 6. Texts: Raymond's "Railroad Surveying," Webb's "Railroad Construction," Searles' "Field Engineering," and Crandall's "Transition Curve." Senior Civil Engrs. 2 semesters, 3 credits each. (Alternates with C. E. 4, and M. D. 6, and will be given in 1913-1914.) Laboratory fee \$2.50 per semester. *Professor Keller.*

11. **ROAD TESTING LABORATORY.** Laboratory practice covering the general physical methods of testing the materials used in road construction, including oils, tars, asphalts, and road metals. Prerequisite: C. E. 9. Elective, open to all Seniors. 2 semesters, 1 credit each. Laboratory fee \$1.00 per semester.

Mr. —————.

12. **CONCRETE AND MASONRY STRUCTURES.** The properties of stone, brick, and concrete, and their uses in engineering structures, such as foundations, retaining walls, piers, abutments, and dams; including the design of arches and dams in stone, and the design of reinforced concrete structures, such as beams, girders, columns, floor slabs, and highway bridges. Lectures and drawing room work, supplemented by library reference. Prerequisites: C. E. 2, 3, 4. Senior Civil Engrs. 2nd semester, 3 credits. *Professor Young.*

13. **SANITARY SURVEY OF WATER SUPPLIES.** Lectures and laboratory practice covering the methods of investigating the purity of a water supply, normal quality of surface and subterranean waters and effect of storage, the physical, chemical, and bacteriological examination of water, the relation between communicable diseases and water supplies. Prerequisite: C. E. 9. Elective, open to all Seniors. 2 semesters, 1 credit each. Laboratory fee \$1.00 per semester. *Professor Keller.*

HOUSEHOLD ECONOMICS.

ART AND DESIGN.

1. **FREEHAND DRAWING.** Study of type models, drawing in outline and light and shade from ornaments, natural objects and casts, freehand perspective. 1st semester, 2 credits.

Asst. Professor Chipman.

2. **FREEHAND DRAWING.** Memory sketching; drawing of plant forms and still life groups in charcoal for the study of composition; cast drawing. Prerequisite: Course 1. 2nd semester, 2 credits.

Asst. Professor Chipman.

3. **COLOR.** Theory of color; consideration of color values and harmony through the medium of water colors, using plant forms, still life, and landscape as subjects. Prerequisite: Course 2. 1st semester, 2 credits.

Asst. Professor Chipman.

4. **COLOR AND DESIGN.** Study of line, dark and light, and color with emphasis upon design; decorative composition; interior household decoration; costume design. Prerequisite: Course 3. 2nd semester, 2 credits.

Asst. Professor Chipman.

5. **HISTORY OF ARCHITECTURE.** Study of the development of architectural styles of the ancient Egyptians, Chaldeans, Greeks, and Romans, and of the Mediæval (Byzantine, Romanesque, Gothic) and Renaissance periods. Consideration of conditions, materials, etc., in their effect upon architecture. 1st semester, 1 credit.

Asst. Professor Chipman.

6. **HISTORY OF SCULPTURE AND PAINTING.** Historical and appreciative study of ancient and mediæval sculpture and of the great schools of painting. Discussion of principles of art structure and composition in relation to the masterpieces. Prerequisite: Course 5. 2nd semester, 1 credit.

Asst. Professor Chipman.

7. **CERAMIC DESIGN AND PORCELAIN DECORATION.** Principles governing line and area composition, study of rhythm and of balance by equal and unequal attraction, making of color scales, rendering of designs in values, application of simple original

designs to tiles, plates, and other suitable porcelain forms. Prerequisite: Course 4. 1st semester, 3 credits.

Asst. Professor Chipman.

8. CERAMIC DESIGN AND PORCELAIN DECORATION. Design course continued. Selection of good shapes in porcelain, discussion of methods of pottery and porcelain manufacture, of ceramic colors, glazes, lusters, and metals; decoration of porcelain in original designs. Prerequisite: Course 7. 2nd semester, 3 credits.

Asst. Professor Chipman.

9. DESIGN AND CRAFTSWORK. Principles of art structure, color scheming, design, with special reference to the requirements of methods of manufacture and materials used, application of original designs to textiles by wood-block printing and stenciling. Prerequisite: Course 4. 1st semester, 3 credits.

10. DESIGN AND CRAFTSWORK. Clay modelling from casts, natural forms, and abstract motifs. Instruction and practice in artistic use of sheet metal; and in leather tooling, from original designs. Prerequisite: Course 9. 2nd semester, 3 credits.

All work of students remains in the department during the College year. The College reserves the right to retain for a period of two years such work as it may select.

Credits will be given for extra work done by students above that required in the outlined courses.

DOMESTIC SCIENCE.

1. TEXTILES. A study of fabrics, their beginnings in the arts and industries of primitive life, the development of spinning and weaving, modern processes of manufacture, economic values, and their effect on social conditions; the principles of dyeing and cleaning, the methods of identifying fabrics; needlework, garment making, and simple drafting. Lectures, discussions, and laboratory work. Prerequisites: Art and Design 1 & 2. 2 semesters, 3 credits each.

Asst. Professor Lee.

2. SELECTION AND PREPARATION OF FOOD. The preparation of food materials, based on a knowledge of their composition and the chemical changes effected by heat and moisture, and the cooking processes that give best results in retaining nutritive

principles in most digestible form. Laboratory fee \$5.00. Prerequisites or parallel: Chemistry 1, 2, 4 & 20. 2nd semester, 3 credits.
Asst. Professor Lee.

3. SELECTION AND PREPARATION OF FOOD. Continuation of 2. 1st semester, 3 credits. Laboratory fee \$5.00.

Asst. Professor Lee.

4. HOUSE CONSTRUCTION, SANITATION, AND DECORATION. Building sites, house plans, building materials, water supply and drainage, plumbing, heating, lighting, ventilation, decoration, and furnishing. Laboratory practice in drawing of plans and in decoration. Prerequisites: Art and Design 1, 2, 3, 4, 5, 6. 2nd semester, 3 credits. *Prof. Keller and Asst. Profs. Chipman and Lee.*

5. DIETETICS. A review of the history of foodstuffs in the body and methods of determining food requirements by means of dietary studies. Physiological and economic considerations affecting the choice of food materials and their place in the diet under normal and abnormal conditions. Prerequisites: Chemistry, 1, 2, 4, Physiology 1. 2nd semester, 3 credits.

Miss _____.

6. ADVANCED COOKERY. Advanced practical work in selection and preparation of meals. Training in the giving of demonstration lectures for those students who wish to teach Domestic Science. Lectures and laboratory work. Prerequisites: Household Economics 3 & 4. Fee \$5.00. 1st semester, 3 credits.

Asst. Professor Lee.

7. HOUSEWORK AND LAUNDERING. The cleaning and care of a house, the use of labor saving apparatus; the use of simple tools for repairs, the application of paints and varnishes; the principles and processes included in laundry work, the use of washers, mangles, and other apparatus. 1st semester, 2 credits.

Miss _____.

8. MILLINERY. The construction and trimming of hats, beginning with the use of foundation materials; making of wire frames from given dimensions, and copying from models, pictures, and original designs. 1st semester, 2 credits.

Asst. Professor Lee.

9. DRESSMAKING. The principles of dressmaking; the taking of accurate measurements; the making and altering of patterns, the choice and economical cutting of material; the making

of gowns and crinoline modeling. Demonstrations, conferences, and manual work. 1st and 2nd semesters, 2 credits each.

Asst. Professor Lee.

10. PERSONAL HYGIENE, HOME NURSING AND EMERGENCIES. The care of the individual, in her relation to environment, the transmission of diseases, the care of children, and what to do in emergencies. Lectures with practical illustrations and experiments. 1st semester, 2 credits. *Miss _____.*

In addition to the courses outlined above, which are designed to meet the needs of the regular students of the College, there will be special classes for students who do not wish to take the full course. The work specified will be of a practical nature and periods will be arranged by appointment.

HUMANITIES.

ENGLISH.

1. COMPOSITION. The principles of exposition, description, and narration; analysis of illustrative specimens; frequent written exercises, and personal conferences with the instructor; collateral reading. Designed to lead not only to correctness of expression, but also to a knowledge of constructive principles. Required of all freshmen. 1st semester, 3 credits. *Professor Andrews.*

2. COMPOSITION. Continuation of course 1. 2nd semester, 3 credits. *Professor Andrews.*

2a. ADVANCED COMPOSITION. A study of Brewster's *English Composition and Style*, with especial emphasis on exposition. Collateral reading. Prerequisites: English 1 and 2. 1st semester, 2 credits. *Professor Andrews.*

3. ENGLISH LITERATURE. The study of representative works in prose and poetry from Shakespeare to Tennyson. Required of all sophomores. 1st semester, 3 credits. *Professor Andrews.*

3b. ENGLISH LITERATURE. Continuation of course 3. 2nd semester, 3 credits. *Professor Andrews.*

4. AMERICAN LITERATURE. The study of representative American poems, essays, and fiction. Prerequisites: English 3 and 3b. 3 credits. *Professor Andrews.*

5. PUBLIC SPEAKING. A study of the principles underlying oral expression; practice in public speaking. 1st semester, 2 credits. *Professor Andrews.*

6. ARGUMENTATION AND DEBATE. A study of the principles of argumentation; analysis of representative orations; practice in the writing of briefs; extemporaneous speaking. Prerequisite: English 5. 2nd semester, 2 credits. *Professor Andrews.*

7. THE NOVEL. A study of the novel as a literary form; analysis of representative novels; collateral reading, reports, and discussions. 1st semester, 2 credits. *Professor Andrews.*

8. THE SHORT STORY. The principles of the short story;

analysis of representative stories; collateral reading; practice in short story writing. 2nd semester, 2 credits.

Professor Andrews.

9. SHAKESPEARE. After a consideration of the development of the English drama, the class will read some of the greater tragedies and comedies, with special reference to their dramatic structure. 2nd semester, 2 credits.

Professor Andrews.

10. THE DRAMA. The principles of dramatic construction; analysis of Elizabethan and modern plays. 2nd semester, 2 credits.

Professor Andrews.

Courses 2a and 4-10 are elective courses, and will be given on request. In order that the necessary text books may be ordered and class hours arranged, requests for courses offered for the first semester should be made not later than June 1, and requests for courses offered for the second semester should be made not later than October 1.

FRENCH.

1. ELEMENTARY FRENCH. Grammar, pronunciation, sentence writing, reading of connected prose. Required of all freshmen who have not received entrance credits in French and are not taking German. 1st semester, 3 credits.

Miss Farley.

2. ELEMENTARY FRENCH. Review of grammar; reading of prose and poetical selections; prose composition. Prerequisite: Course 1. 2nd semester, 3 credits.

Miss Farley.

3. INTERMEDIATE FRENCH. Reading of advanced prose, study of a representative work of French tragedy or fiction; sight reading, composition, conversation, review of grammar. Required of all sophomores who have taken courses 1 and 2. Open to all freshmen who have received credits in French. 1st semester, 3 credits.

Miss Farley.

4. INTERMEDIATE FRENCH. Rapid reading in and out of the class of representative French authors; prose composition, conversation. Prerequisite: Course 3. 2nd semester, 3 credits.

Miss Farley.

5. ADVANCED FRENCH. Advanced conversation, and reading; literary study of at least one work of French classical literature;

outside reading of modern French prose with written reports thereon. Open to students who have attained a good rank in courses 1--4, or who show satisfactory evidence of fitness. 1st semester, 3 credits. *Miss Farley.*

6. **ADVANCED FRENCH.** Lectures on the history and development of French literature; frequent talks and discussions on phases of French life; practice in reading aloud of French prose and verse; collateral reading outside of class, with written reports thereon. Prerequisite: Course 5. 2nd semester, 3 credits. *Miss Farley.*

GERMAN.

1. **ELEMENTARY GERMAN.** Grammar, pronunciation, sentence writing, reading of connected prose. Required of all freshmen who have not received entrance credits in German and are not taking French. 1st semester, 3 credits. *Mr. Zurbuchen.*

2. **ELEMENTARY GERMAN.** Grammar continued. Translation of prose and poetical selections, prose composition, acquirement of a practical vocabulary, conversation. 2nd semester, 3 credits. *Mr. Zurbuchen.*

3. **INTERMEDIATE GERMAN.** Comprehensive review of the essentials of grammar. Reading of advanced prose, study of a representative work by Lessing, Schiller, or Goethe. Sight reading, composition, conversation. Required of all sophomores who have taken courses 1 and 2. Open to all freshmen who have received entrance credits in German. 1st semester, 3 credits. *Mr. Zurbuchen.*

4. **INTERMEDIATE GERMAN.** Grammatical review continued. Reading of scientific German, with collateral assignments outside of class; study of at least one representative work of modern German literature. Sight reading, prose composition, conversation. 2nd semester, 3 credits. *Mr. Zurbuchen.*

5. **ADVANCED GERMAN.** Study of the minutiae of grammatical scholarship in connection with the reading of texts. Advanced conversation, composition, and reading, literary study of at least one standard work of German classical literature in class; outside reading of modern German prose with written reports thereon.

Open to students who have attained a good rank in courses 1-4, or who show satisfactory evidence of fitness. 1st semester, 3 credits.

Mr. Zurbuchen.

6. **ADVANCED GERMAN.** Lectures on the history and development of German literature; frequent talks and discussions on phases of German life, institutions, and ideals; practice in reading aloud of German prose and verse; collateral reading outside of class of modern German novelists or dramatists, with written reports thereon. 2nd semester, 3 credits.

Mr. Zurbuchen.

HISTORY AND ECONOMICS.

1. **ECONOMIC AND INDUSTRIAL HISTORY.** Lectures, recitations, and reading dealing with the disappearance of serfdom, the rise of industrial efficiency, the protectionist, free trade, modern labor movements, and other phases of modern European history of their bearing on the welfare of the people. 1st semester, 3 credits.

Miss Yoder.

2. **ECONOMY AND INDUSTRIAL HISTORY (continued).** Lectures, recitations, and library work dealing with the economic aspects of American colonization, colonial commerce, manufacture, and labor supply, the development of internal improvements, agriculture, transportation, and industrial expansion. 2nd semester, 3 credits.

Miss Yoder.

3. **PRINCIPLES OF POLITICAL ECONOMY.** Lectures, recitations, and library work on the meaning and application of the conceptions of wealth, value, money, utility, capital, supply, demand, distribution, wages, profits, rents, interest, and credit. 1st semester, 3 credits.

Miss Yoder.

4. **POLITICAL INSTITUTIONS.** Lectures, recitations, and library work on the principles of politics and the development of political institutions. Constitutional and administrative laws, with reference to their practical working. 2nd semester, 3 credits.

Miss Yoder.

MATHEMATICS.

To insure a thorough grounding in the fundamentals of mathematics, so necessary in all a student's future work, all freshmen are required to study mathematics.

The courses for engineers aim to render mathematics a practical tool for the students. All principles are illustrated by the solution of a large number of problems, which are made to bear as directly upon their future work as possible. Field work with the transit and sextant furnishes many practical problems.

1. MENSURATION AND TRIGONOMETRY. Mensuration and plane and spherical trigonometry, with practical problems. Required of all freshmen except students in Engineering. 1st semester, 3 credits. *Professor Ballou.*

2. ALGEBRA. Simple series, inequalities, symmetric functions, binomial theorem, permutations and combinations, probability, elements of the theory of equations, determinants, expansion of functions in series, convergence of series. Required of all freshmen except students in Engineering. 2nd semester, 3 credits. *Professor Ballou.*

3. ALGEBRA AND ANALYTIC GEOMETRY. (a) A rapid course in advanced algebra, covering about the same topics as course 2. (b) The essentials of analytic geometry. Required of Engineering freshmen. 1st semester, 5 credits. *Professor Donaghho.*

4. TRIGONOMETRY AND INTRODUCTORY CALCULUS. (a) Spherical trigonometry, with practical problems from field work with the transit and sextant. (b) A short course in differentiation. Required of Engineering freshmen. 2nd semester, 5 credits. *Professor Donaghho.*

5. CALCULUS. Differential and integral calculus, with practical problems. Required of students in Engineering. 1st semester, 3 credits. *Professor Donaghho.*

6. CALCULUS. Continuation of course 5. Required of students in Engineering. 2nd semester, 3 credits. *Professor Donaghho.*

7. ASTRONOMY. A brief course in practical astronomy, adapted to the needs of engineering students. 1st semester, 3 credits (Alternates with C. E. 9; will be given in 1913-1914.) *Professor Donaghho.*

8. ASTRONOMY. A lecture course in descriptive astronomy. 2nd semester, 1 or 2 credits. (Will be offered in 1913-1914.) *Professor Donaghho.*

9. CALCULUS. A course designed to give a rapid review of the applications of the calculus, by means of simple practical problems, followed by an intensive drill, with more difficult ones. 1st semester, 1 or 2 credits. Prerequisites: Courses 5 and 6. *Professor Donaghho.*

10. CALCULUS. Continuation of Course 9. 2nd semester, 1 or 2 credits. *Professor Donaghho.*

SCIENCES.

BIOLOGY.

1. FIELD BIOLOGY. A course consisting entirely of field work, designed to give the student a vivid and first-hand knowledge of the general principles and phenomena of the biological world. Within easy reach of the College is a great variety of representative biologic regions. The natural history of these type regions is studied thoroly *in situ*, and fully recorded in written reports.

One afternoon (1—5 p. m.) per week; four all-day excursions by arrangement. No fee is charged. Students registering for this course must provide themselves with suitable tramping clothes, field note book, and Coddington pocket lens. 2nd semester, 1 credit. Prerequisites: Botany 1, and Zoology 1.

Professors Bryan and MacCaughey.

BOTANY.

Attention is called to the remarkable variety and abundance of plant life in the vicinity of Honolulu. The facilities for botanic and horticultural studies are unique, perhaps unparalleled. Within a radius of a few miles of the botanic laboratory are a deep-sea flora, coral reefs, coral-, lava-, and tufa-beach floras, coastal-plain, foothill, and mountain floras. The marine and the mountain (4000 ft.) floras are both remarkably easy of access.

There is not only this rich abundance of indigenous plant life, but also an unusual variety of introduced plants. There is a great diversity of flowering plants, grasses, ornamental shrubs and vines, vegetables, and small fruits, each species being usually represented by a number of varieties. Unique problems arise as to acclimatization, relations of insects and fungi, and structural and physiological modifications due to new environment.

The laboratory is furnished with standard microscopes and work tables, individual lockers, chart cabinets, balance cabinet, reagent and supply cases, electric table-lamps, tap, filtered, and distilled water, and numerous gas-burners for heating material. There are complete facilities for stereopticon projection.

Plans are now under way for utilizing suitable portions of the college land for permanent orchards, gardens, slat-houses, and other accommodations for the horticultural activities of the department. There are now available a shade-house, benches, flats, pots, supplies of various potting media, etc., spray machinery and materials, and other useful horticultural implements.

The microscopic equipment comprises Bausch and Lomb and Leitz microscopes, including the best patterns of demonstration, projection, portable, photo-micrographic, research, and elementary instruments. Accessories include Abbe camera lucida, filar, ocular, and stage micrometers of several types; spectro-micrographic equipment; mechanical stages, warm stages; and series of Leitz, Zeiss, Bausch and Lomb, and Spencer lenses. For photo-micrography there is a Bausch and Lomb horizontal camera, with all needful accessories.

For work in plant histology and pathology, and bacteriology, the laboratory is furnished with sterilizers of several types, incubators, refrigerator, water-baths, paraffine-baths, imbedding oven, electric centrifuge, precision and student microtomes, balances, filtration apparatus, a large stock of chemicals, stains, and reagents of the best quality; and supplies of all requisite glassware.

Standard apparatus for experimental work in plant physiology, as planned by Ganong of America, Detmer of Germany, and Dey Rolles of France, is provided, together with facilities for the construction of original apparatus, and for the study of plants in aquaria, thermostats, and other control devices.

Photographic equipment consists of an 8x10 enlarging and reducing camera; several portable cameras for various kinds of work; a panoramic outfit; ray-filters, tele-photo attachments, and other needful accessories.

For field excursions and biologic survey-work, the department has collecting apparatus and containers, portable plant presses, field instruments for the recording of meteorologic data, binoculars, Abney level, pocket sextant, prismatic compass, and other field equipment.

Illustrative material is used abundantly in all courses. In addition to freshly collected material, which is available at all seasons, there are several herbaria; special collections of algæ and lichens, conifer material from Maine; complete sets of wood-

sections by Hough, and photo-micrographs by Weale; series of commercial woods, drugs derived from plants, spices, nuts, grains, fibers, vegetable oils and gums, and other economic products; a large series of DeyRolles models in staff; and a set of fossil plants from Ward.

Wall-charts by Wolff-Maage, Engleder, Goering, Kny, and others supplement the growing collection of lantern slides and photographs.

Horticultural material includes extensive collections of flower, vegetable, and ornamental seeds; spray materials and mixtures; garden tools, including spray pumps of several types; a garden herbarium; and a series of DeyRolles models in staff, illustrating important fruit types, methods of grafting, etc.

For advanced students doing research work, the general herbarium, under the charge of Mr. Joseph F. C. Rock, is available. This is the most complete collection in the world of the indigenous flora of Hawaii, and contains a large number of types, and much material identified by specialists.

The library includes the standard works and files of important periodicals, and many rare botanic works. For geographical studies there is an 18-inch suspension globe by Johnson, large wall maps of world-divisions, and of the islands of this group, and a number of excellent atlases.

1. **PRINCIPLES OF BOTANY.** The fundamental principles of plant morphology and physiology. A survey of the chief plant groups, with field and laboratory studies of representative types. The evolutionary process is traced thru the plant series. Special studies of representatives of angiosperm families, indigenous and introduced. The physiological processes and phenomena of plant-life are considered in detail.

Students registering for this course must provide themselves with special laboratory and field note books, Coddington pocket-lens, and Coulter, Barnes, Cowles "Text-book of Botany," Vol. I. Laboratory fee, \$1.00.

Lectures, laboratory and field work, recitations and conferences. Required of Freshmen in Science, Agriculture, and Household Economics. 1st semester, 3 credits, (one laboratory period, one field period and one discussion period per week).

Professor MacCaughey.

2. **PRINCIPLES OF BOTANY.** Detailed consideration of the ecological relationships of roots, leaves and stems; studies in the reproduction and dispersal of plants; plant geography, paleobotany and economic botany.

These two courses form a single general survey of the large and vital facts of botany. They are designed to give the student a thoro and practical working-knowledge of the subject, and afford a basis for further study or research.

Students must provide themselves with Coulter, Barnes, Cowles "Text-book of Botany" Vol. II. Laboratory fee \$1.00. Other equipment as for Course 1.

In addition to the regular laboratory and field work, attendance is required upon two all-day Saturday excursions. These are arranged for by mutual agreement.

Lectures, laboratory and field work, recitations and conferences. Required of Freshman in Science and Agriculture. 2nd semester, 3 credits as above. Prerequisite—Botany 1.

Professor MacCaughey.

3. **DENDROLOGY.** A survey of the morphology and histological structure, classification, life histories, diseases and enemies of timber trees, from the standpoint of Hawaiian and North American forest conditions; detailed studies of wood structure as affecting the physical, mechanical, and chemical properties of woods; geographical distribution of timber trees, rate of reproduction, and relation of these to lumber production; the forest flora and fauna; ecological factors, and their influence upon the forest.

Particular attention is given to the imported and commercial indigenous timbers of Hawaii.

Students registering for this course must provide themselves with special field and laboratory note-books, Coddington pocket lens, Stone's "Timbers of Commerce" and Green's "Principles of American Forestry." Laboratory fee \$1.00.

In addition to the regular field and laboratory work, attendance is required upon one all-day field trip. Required of Seniors in C. E. 1st semester, 2 credits.

Professor MacCaughey.

4. **GENERAL BACTERIOLOGY.** The lectures cover the field of general bacteriology, emphasizing economic features, especially in relation to agricultural processes, and to public health; taxo-

onomic studies of important families and genera; detailed surveys of the morphologic and physiologic characters of representative pathogenic and non-pathogenic species. The analytical keys of Lehmann and Neumann, and Chester are discussed and used in laboratory work. Botany 1 & 2 form a desirable groundwork for this course. Three three-hour laboratory periods per week. Required of juniors in Science, Agriculture, C. E., and Household Economics. 1st semester, 3 credits.

Miss Gulick.

5. PLANT PATHOLOGY. A laboratory course, comprising studies of the classification, distribution, structures and life histories of typical plant diseases; fungus, bacterial, slime-mold, and physiological diseases; habitat- and cultural-relationships; interrelations of fungus and host; germination; climatologic factors; artificial infection; methods of identification in the field, by cultural methods, and by microscopic mounts; preparation and preservation of diseased material; histologic technique; photography and photo-micrography as adjuncts in record-making. Text: Duggar. 2nd semester, 1 or 2 credits. Open only to seniors who have taken Botany 1, 2, and 4.

Professor MacCaughy.

6. PLANT PHYSIOLOGY. A laboratory course, including exact studies of the physiologic activities of selected plants. Field studies of the physiologic aspects of plant ecology; effects of artificial environment conditions; quantitative studies of nutrition, respiration, growth, and movement; the physiology of reproduction; the significance of tropisms; methods of obtaining precise data; tabulation and interpretation of data; the correct usage of apparatus, principles of control, construction of measurement and control devices. Laboratory work is supplemented by extensive reading, which culminates in the preparation of a careful report upon some important topic. Text: Pfeffer. 1st semester, 1 or 2 credits. Open only to seniors who have had Botany 1, 2, and 4.

Mr. _____.

7. PLANT MORPHOLOGY. A laboratory course, covering detailed structural studies of some selected plant or group of plants. Field work, collection and preservation of material, gross and microscopic examination; the important elements of plant structures, from the viewpoint of their onto-

genetic and phylogenetic development, and their physiologic functions; observations and records of anatomical variations, and their significance in plant-breeding work; significance of species, varieties, mutants, etc.; studies of organography, following Strasburger and Goebel, ecologic field work,—modifications of roots, stems, leaves, and floral structures; pollination devices, dissemination devices, protective devices; recording morphologic data by means of description, tabulation, plotting of curves, drawings and diagrams, blue-prints, photographs, photo-micrographs. Students may prepare an herbarium in addition to the regular work. 1st semester, 1 or 2 credits. Open only to juniors and seniors who have had Botany 1 and 2. *Professor MacCaughey.*

8. **ADVANCED BACTERIOLOGY.** A laboratory course, with special reference to exact determinative analyses, supplemented by thorough bibliographical studies. The student may elect work in one of three divisions,—taxonomic, pathogenic or industrial bacteriology. Emphasis is laid upon the use of the microscope and microscope accessories; special technique, including methods of cultivating anærobic and pathogenic forms; preparation of special media; preparations of bacteria in tissues; principles of vaccines, antitoxins, etc.; photography and photo-micrography as aids in describing and identifying micro-organisms. Text: Chester, "Determinative Bacteriology." Open only to juniors and seniors who have taken Botany 4. 2nd semester, 1 or 2 credits. *Miss Gulick.*

9. **RESEARCH.** Credit and nature of work arranged upon consultation. Open only to seniors of good standing who show sufficient preparation and ability advantageously to carry on studies of an investigational nature. Emphasis is given to problems of local pertinence and interest.

CHEMISTRY.

In addition to the usual equipment for courses in general chemistry and qualitative analysis, there are opportunities for both simple and advanced work in quantitative analysis. For this purpose the laboratory is supplied with various kinds of platinum ware, with volumetric apparatus, and with excellent analytical balances, including a superior one of Rueprecht's make.

For still more advanced work there are complete sets of apparatus for gas analysis and oil testing, including a Mahler's bomb calorimeter.

Provision has been made for work in physical chemistry. The apparatus includes that of Victor Meyer for vapor density determination, and that of Beckmann for determination of molecular weight.

Facilities are now offered for instruction in sugar chemistry. There is already at hand a Lippich's half-shadow polariscope, with accessories, and an Abbe-Zeiss refractometer.

For experiments in spectroscopy, a Browning's analyst spectroscope has recently been purchased.

It is the purpose to add other pieces of chemical apparatus as the need arises.

1. GENERAL CHEMISTRY. Lectures on the more important non-metallic elements, illustrated with experiments, charts, and specimens; recitations and laboratory experiments. 1st semester, 3 credits. Laboratory fee \$2.00. *Professor Ballou.*

2. GENERAL CHEMISTRY. A continuation of Chemistry 1, with special attention to the study of metallic elements. 2nd semester, 3 credits. Laboratory fee \$2.00. *Professor Ballou.*

3. THEORETICAL CHEMISTRY. A study of the laws and theories of chemistry, with especial emphasis upon their application in the solution of problems, and upon their value in the interpretation of chemical facts. Prerequisites: Chemistry 1 & 2. 1st semester, 2 credits. *Professor Dillingham*

4. QUALITATIVE ANALYSIS. Principally a laboratory course, covering the characteristic reactions of the metals, and group separations of bases and acids. In a lecture or recitation period methods are given and the reactions studied. 1st semester, 3 credits. Laboratory fee \$2.00. *Professor Dillingham.*

4a. QUALITATIVE ANALYSIS. Principally a laboratory course covering blowpipe methods for analysis of solids, and methods for getting solids into solution. Each student analyzes a series of about forty unknowns, covering a wide range of inorganic substances. In a lecture or recitation period methods are given and the reactions studied. 2nd semester, 3 credits. Laboratory fee \$2.00. *Professor Dillingham.*

5. ORGANIC CHEMISTRY. The Aliphatic Series. Lectures,

collateral reading, discussions, and frequent quizzes. For those who specialize in chemistry, this is accompanied by the laboratory course. Prerequisites: Chemistry 1 & 2. 1st semester, 3 credits.
Professor Dillingham.

5a. ORGANIC CHEMISTRY. The Aromatic Series. A continuation of course 5. 2nd semester, 3 credits.

Professor Dillingham.

6. ORGANIC CHEMICAL LABORATORY. To be taken in conjunction with courses 5 and 5a. A study of the preparation, separation, and analysis of a number of organic compounds. 1st and 2nd semesters, 1 credit each. Laboratory fee \$3.00 for each semester.

Professor Dillingham.

7. INDUSTRIAL CHEMISTRY. A study of the chemistry of the more common chemical industries, with special reference to the industries of local importance. 1st semester, 3 credits.

(May be omitted in 1913-1914.)

Mr. _____.

8. INDUSTRIAL CHEMISTRY LABORATORY. To be taken preferably in connection with course 7. The student repeats manufacturing processes on as large a scale as is possible in a laboratory, and prepares a number of pure compounds from crude materials. 1st semester, 3 credits. Laboratory fee \$3.00.

(May be omitted in 1913-1914.)

Mr. _____.

9. AGRICULTURAL CHEMISTRY. Lectures, text-book work, and supplementary reading. The chemistry of air, soil, and plant and animal life. Prerequisites: Chemistry 1, 2, 4 & 5. 1st semester, 3 credits.

Professor Dillingham.

10. QUANTITATIVE ANALYSIS. The principles of gravimetric analysis; analyses of a carefully selected series of pure compounds; the determination of the constants of the balance and calibration of laboratory glassware; volumetric analysis. Recitations, discussions, and quizzes. Prerequisites: Chemistry 1, 2 and 4. 1st semester, 3 credits. Laboratory fee, \$2.00.

Professor Dillingham.

12. QUANTITATIVE ANALYSIS. A continuation of course 10. Acidimetry, alkalimetry, and other volumetric methods; complete analyses of limestone, boiler scales, and common alloys. Prerequisite: Chemistry 10. 2nd semester, 3 credits. Laboratory fee \$2.00.

Professor Dillingham.

12a. QUANTITATIVE ANALYSIS. An extension of course 12, for those who wish to devote additional time to the subject. 2nd semester, 2 credits. Laboratory fee \$2.00.

Professor Dillingham.

14. FOOD ANALYSIS. Laboratory work in analysis of milk, butter, meats, breadstuffs, and other articles of food. Required of students in Household Economics, but open to others who have completed Chemistry 4, 5 & 10. 2nd semester, 3 credits. Laboratory fee \$3.00.

Professor Dillingham.

15. CHEMICAL LITERATURE. A library course, in which articles appearing in current chemical periodicals are studied. Prerequisites: Chemistry 3, 4, 5, 7 & 13, German 1--4. 1st semester, 1 credit.

Professor Dillingham.

16. SPECIAL QUANTITATIVE ANALYSIS. Analyses of special substances, such as food products, soils, fertilizers, ores, iron and steel, water, etc. Prerequisites: Chemistry 10 & 12. 1st semester, 3 credits. Laboratory fee, subject to change, \$3.00.

Mr. _____.

17. CHEMICAL LITERATURE. A continuation of course 15. 2nd semester, 1 credit.

Professor Dillingham.

18. CHEMICAL RESEARCH. The preparation of a thesis on some subject in pure or applied chemistry. 2nd semester, 5 credits. Laboratory fee, depending upon nature of work chosen, \$3.00 to \$5.00.

Professors Dillingham and Walker.

19. SPECIAL QUANTITATIVE ANALYSIS. A continuation of course 16, or a course parallel to 16, for students who are unable to elect the subject in the first semester. 2nd semester, 3 credits. Laboratory fee \$3.00, subject to change.

Mr. _____.

20. QUALITATIVE ANALYSIS OF FOODS. Experiments dealing with the composition of food constituents and of foods; qualitative analysis of foods and the detection of the common food adulterants. Required of students in Household Economics, and open to others who have completed Chemistry 1, 2 & 5. 2nd semester, 3 credits. Laboratory fee, \$2.00.

Professor Dillingham.

21. QUALITATIVE ANALYSIS OF FOODS. A continuation of course 20. 1st semester, 3 credits. Laboratory fee \$2.00.

Professor Dillingham.

ENTOMOLOGY.

In Honolulu the student of biology works under especially favored conditions. There is no dormant season; plants and animals are always active and may be collected at the time that they are required without the necessity, that one experiences in northern climes, of working largely from preserved material. This constant association with the living things adds materially to the interest in the work.

In all courses a special effort is made to have the student realize that in the study of insects he is dealing with forms which in many cases are of vital importance to his welfare. The lecture and laboratory work is closely correlated, and in the morphological study, deals principally with a few types, in order to avoid the confusion that arises from a multiplicity of forms. Carefully planned field excursions and rearing experiments are arranged to bring the student into the closest appreciation of our daily problems.

The courses should be taken in their natural order and are intended to awaken in the student a keen appreciation of the general principles of insect life. The economy of beneficial species is emphasized as well as the principal methods for the control of those that are injurious.

A collection is being developed which represents many of the most common economic forms, both local and from the States. Also, an abundance of other illustrative material is available for class use.

The laboratories are well supplied with Zeiss microscopes, dissecting lenses and the necessary glassware. Rearing and collecting apparatus of a variety of forms is available in sufficient quantity to meet the present needs of the department.

A photographic room, used in common with the department of botany, is thoroughly equipped with the most improved cameras and other needful accessories.

1. GENERAL ENTOMOLOGY. This is a study of the general elementary morphology, physiology, and classification of insects. Some attention is given to the principal economic forms, and to the general methods of insect control.

Lectures on the characteristics of the orders, suborders and more important families of insects, with special reference to the injurious and beneficial species, and methods of controlling in-

sect pests. Laboratory work includes a study of the external structure of insects and practice in their classification, together with field work. Prerequisite: Zoology 1. 2nd semester, 3 credits. Laboratory fee \$1.00. *Professor Illingworth.*

2. **ELEMENTARY SYSTEMATIC ENTOMOLOGY.** This is a study of the wing venation of insects, and the identification of specimens belonging to the more important orders and families. Considerable attention is given to the collection and preparation of specimens. Prerequisite: Entomology 1. 1st semester, 3 credits. Laboratory fee \$1.00. *Professor Illingworth.*

3. **GENERAL ECONOMIC ENTOMOLOGY.** This is a study of some of the principal economic species of insects, of the methods of controlling them, and of the literature of economic entomology. Methods commonly used in the investigation of problems in economic entomology are studied and discussed. Considerable attention is given to the collection of specimens showing life histories of some of the principal economic species. Prerequisites: Entomology 1 and 2. 2nd semester, 3 credits. Laboratory fee \$2.00. *Professor Illingworth.*

4. **RESEARCH IN ECONOMIC ENTOMOLOGY.** Opportunities for research work in this field are especially attractive, since the problem can be developed throughout the year without interruption. Open only to students who have shown marked ability in the study of entomology. Prerequisites: Entomology 1, 2 and 3. Throughout the year, 3 or more credits each semester. Laboratory fee 50 cents for each credit. *Professor Illingworth.*

GEOLOGY.

1. **DYNAMIC AND STRUCTURAL GEOLOGY.** Lectures, text, laboratory, and field work; a general survey of the materials of the earth's crust; its construction; the working of the constructive and destructive agencies within the earth and upon its surface, together with a brief history of the earth, and the evolution of plant and animal life upon it. The course is based largely on the geology of North America, but frequent reference is made to the geology of the Islands. An elementary knowledge of physics, chemistry, zoology, and botany is required. 2nd semester, 3 credits. Laboratory fee \$1.00. (Alternates with courses Math. 7, and C. E. 9, and will be given on alternate years except by special arrangement.) *Professor Bryan.*

METEOROLOGY.

1. **ELEMENTARY METEOROLOGY.** Lectures and laboratory work. The lectures present the subject under the following headings: The earth's atmosphere, its origin, height, composition, and relations to man; the sun's control over temperature, the effects of the atmosphere upon solar radiation, colors of the sky; the history, construction, exposure, and use of thermometer, barometer, anemometer, rain-gauge, psychrometer, nephoscope, including the simpler self-recording instruments; the distribution of temperature, pressure, winds, cloudiness, and rainfall over the earth's surface; the general circulation of the atmosphere, the prevailing winds, and their relations to the distribution of temperature and pressure; mountain and valley winds, land and sea breezes, cold waves, hot waves, foehn and chinook, bora, and other special winds; dew; frost, prediction, and methods of protection; fogs, land and ocean; clouds, their formation, classification, and value as weather prognostics; the vertical distribution of temperature in the free air, as determined by balloon and kite ascents; rain, snow, sleet, etc., methods of formation, and conditions of occurrence; cyclones, extra-tropical and tropical (hurricanes, typhoons), characteristics, theories, tracks, seasons, and regions of occurrence; rules for handling ships in tropical cyclones; anticyclones; thunderstorms, hail, protection from lightning; tornadoes; waterspouts; controls of our weather changes; weather forecasting. The laboratory work consists in the construction and study of weather maps, of temperature, pressure, wind and rainfall charts, and of meteorological diagrams; practice in the use of the ordinary meteorological instruments, and in the corrections of the observed readings; the barometric determination of altitudes; individual records of observations; weather forecasting, etc. 2nd semester, 3 credits.

Professor Ballou.

2. **ADVANCED METEOROLOGY.** Special problems in the meteorology of Hawaii. Open only to students who have completed Meteorology 1. 1st semester, 2 or 3 credits. *Professor Ballou.*

PHYSICS.

1. **MECHANICS AND HEAT.** The fundamental notions of work, energy, power, and the units used in measurement; the laws of gases, thermometry, calorimetry, etc. 1st semester, 3 credits. Laboratory fee \$1.00.

Professor Ballou.

2. **MAGNETISM AND ELECTRICITY, SOUND AND LIGHT.** Electrical units, theory of electrical measurements, induction, magnetism of iron, the electro-magnetic theory, and the fundamental laws of wave motion as applied in light and sound. 2nd semester, 2 credits. Laboratory fee \$1.00. *Professor Ballou.*

3. **ELECTRICAL MEASUREMENTS.** A laboratory course, making application of the theories of electrical measurements embraced in course 2. Includes measurement of current voltage, resistance, capacity, magnetic properties of iron, etc. 2nd semester, 3 credits. Laboratory fee \$1.00. *Professor Ballou.*

PHYSIOLOGY.

1. **HUMAN AND COMPARATIVE PHYSIOLOGY.** Lectures and demonstrations on the elements of physiology, with special reference to the relationships in the anatomy of man and animals. Attention is given also to the vital organs, with reference to health and disease. 2nd semester, 3 credits. Laboratory fee \$2.00. *Professor Bryan.*

PSYCHOLOGY.

1. **ELEMENTARY PSYCHOLOGY.** Lectures and recitations dealing with the phenomena of sensation, affection, and attention, supplemented by laboratory work in experimental psychology. Required of seniors in Household Economics and Engineering. 1st semester, 3 credits. *Professor Andrews.*

SUGAR TECHNOLOGY.

1. **SUGAR TECHNOLOGY.** Laboratory and lecture course intended to fit the student for the position of chemist in a sugar house laboratory.

Among other topics taken up are the theory and construction of the polariscope and the refractometer, the calibration and testing of these and other laboratory apparatus, general laboratory routine and the fitting out of a sugar laboratory, the methods of sampling and of analysis of the various products met with in a cane sugar factory.

Instruction is also given in sugar house calculations, and considerable time is devoted to the working out of problems involving the yields and losses ordinarily encountered in actual

factory work, and the making out of typical laboratory reports such as are required by plantations in the Hawaiian Islands.

In order to take this course the student should have a working knowledge of general chemistry and laboratory manipulations. 1st and 2nd semesters, 3 credits each.

Professor Walker.

2. SUGAR TECHNOLOGY. Lectures and recitations on the basic principles involved in the manufacture of cane sugar, with discussion of types of machinery and methods used in the best modern factories, embodying such topics as milling, the effect of maceration, clarification of juices, filter press working, multiple effect evaporation, sugar boiling, including the most usual methods of exhausting molasses by boiling massecuites to fixed purities, the use of crystallizers, curing and drying of sugars.

A brief description of beet sugar manufacture, refining and the making of white sugar without char filtration is also given.

Students are given the opportunity of visiting the nearby plantations and witnessing the processes of manufacture as carried out in actual practice.

It is recognized that theoretical instruction can be of value only when accompanied or supplemented by practical work, and the College will endeavor to secure positions for students who satisfactorily complete this course, so that they may acquire the necessary practice in factory technique and sugar house manipulations under the most favorable conditions.

This course may be taken with or must follow the course outlined above. 1st and 2nd semesters, 2 credits each.

Professor Walker.

3. SUGAR TECHNOLOGY. Research. Preparation of a thesis involving a thorough study of the available bibliography of, and original work on, some topic pertaining to the chemistry or manufacture of sugar. 2nd semester, 5 credits.

Professor Walker.

ZOOLOGY.

The courses in zoology are intended to meet the demands both of elementary and advanced students, and are arranged to take advantage of the wealth of illustrative and research material available in the Island fauna throughout the year.

The Islands have already furnished rich material that has

been widely used by philosophical zoologists in their attempts to explain the great fundamental problems of evolution. Abundant opportunity still remains in the Island fauna for original research work in any of the fields of animal life. Persons desiring to specialize in zoological subjects will find ample opportunity and facility for prolonged and serious study.

The required courses are intended to be both cultural and practical, while the advanced courses offered, or those which may be arranged to suit the individual needs of the student, are planned with a view to vocational training along the lines indicated.

The equipment for this work is thoroughly modern. Though not as extensive as in older institutions, it is brought together with reference to the possible future development of the College as an institution for biological research. Present requirements are being well provided for. The lecture room and laboratory are now supplied with such new equipment as is required by regular students. Special appliances are added from time to time as occasion for their use arises.

The collections of specimens and illustrative material are being increased as rapidly as storage space will permit. A teaching equipment of charts, models, photographs, microscope slides, stereopticon slides, and alcoholic specimens is at hand. The new laboratories are conveniently located, and are equipped with a working library, microscopes, dissecting lenses, projecting apparatus, aquaria, and other necessary accessories.

1. **INVERTEBRATE AND VERTEBRATE ZOOLOGY.** Lectures, text, and laboratory. A study of the structure, development, life histories, classification, relationship, and distribution of animals, with especial reference to the economic importance of many forms. 1st semester, 3 credits. Laboratory fee \$2.00.

Professor Bryan.

2. **OCEANOGRAPHY.** Lectures, observations, laboratory, and library assignments. A general survey of the ocean as a great natural realm, with a view to bringing out its bearing on the facts underlying such subjects as geology, botany, zoology, evolution, distribution, climatology, etc. Some knowledge of physics, chemistry, zoology, and botany is desired. 1st semester, 3 credits. Laboratory fee \$2.00.

Professor Bryan.

3. **ICHTHYOLOGY.** Lectures, field work, laboratory, and re-

search. A technical study of fishes, designed for students desiring a working knowledge of the subject in preparation for serious systematic, biological or fish cultural work. All traits of the *pisces* are as fully treated as time will permit, especially those which deal with the evolution and divergence of the various classes and orders. Much of the work is given in the laboratory, where use is made of the abundance of fresh material available from the local market. 1st semester, 3 credits. Laboratory fee \$5.00.
Professor Bryan.

4. ICHTHYOLOGY. Lectures, field work, laboratory, and research. A continuation of course 3, which is a prerequisite. 2nd semester, 3 credits. Laboratory fee \$5.00.

Professor Bryan.

5. SPECIAL WORK IN ZOOLOGY. Special work along the lines of evolution, variation, heredity, ecology, ornithology, etc., can be arranged for according to the demands of properly qualified students. Laboratory fees to be arranged in accordance with the work.

Professor Bryan.

6. RESEARCH WORK. Opportunities for research work in zoology in Hawaii are especially numerous and attractive, and many of them are of undoubted economic importance. Seniors are encouraged to select at the beginning of the year subjects where investigational work can be made the basis of a thesis. The subject chosen and the time spent upon it will determine the number of credits allowed, but from 2 to 5 credits can be allowed for each semester's work. Laboratory fees to be arranged in accordance with the work.

Professor Bryan.

EXTENSION WORK.

In Charge of Professor MacCaughey.

The Extension Courses are designed to meet the needs of persons unable to attend the regular sessions of the College. The scope of the extension work may be shown as follows:

1. CORRESPONDENCE COURSES.

- (a) Soils and Crops.
- (b) Poultry Culture.
- (c) Practical Horticulture.
- (d) General Botany.
- (e) Nature-Study for Teachers.
- (f) Zoology.
- (g) Sewing and Cooking.

Each course consists of eighteen assignments. Persons may enroll at any time during the College year. Tuition fee is \$5.00. Text-books and other needful equipment are supplied free.

2. SHORT COURSES.

1908. Twenty-six evening sessions, including Soils, Fertilizers, Botany, Agronomy, Horticulture, Plant Breeding, Forestry, Economic Entomology.

1909. Twenty-six evening sessions; subject-matter as above.

1912. Fifteen afternoon sessions; subject-matter dealing with various phases of elementary school curricula.

3. MOVABLE SCHOOLS.

Summer of 1909. President Gilmore and Professor Young in charge. Agricultural and Engineering subjects.

4. EXHIBITS AND DEMONSTRATIONS.

Astronomical Demonstrations,—College Observatory, Kaimuki. The facilities of the Observatory are available to individuals or parties, upon arrangement.

Agricultural and Biologic Exhibit,—Poultry Show, 1911. Soils, Field Crops, Model Portable Poultry House, Horticultural and Biologic Exhibits.

Clean Milk Exhibit,—Public Welfare Exhibit, 1912.
Clean Milk, Bovine Tuberculosis, Model Ice Box,
Foods and Dietetics.

5. HAWAII EDUCATIONAL REVIEW.

Monthly periodical published with the cooperation of the
Territorial Department of Public Instruction. Estab-
lished January, 1913.

6. TRAVELING LIBRARIES.

Organized November, 1911, with co-operation of De-
partment of Public Instruction. Library Circuits on
Oahu, Hawaii, Maui, and Kauai, covering the larger
rural communities. A library remains in a region for
one month or longer, the school principal lending the
books to teachers, pupils and others.

7. LOANS OF BOOKS AND MATERIAL.

Books from the College Library and illustrative material
of various kinds, such as specimens, models, wall-
charts, lantern slides, are lent without charge to qual-
ified individuals in any part of the Territory, borrower
paying transportation expenses.

8. IDENTIFICATION WORK.

The College undertakes, in so far as its facilities permit,
the identification of various materials submitted to it,
—viz.: plants, weeds, seeds, marine life, geologic speci-
mens, building materials, etc. This work is gratuitous,
and is of necessity limited.

9. RECOMMENDATIONAL WORK.

Recommendations regarding the various problems con-
nected with such enterprises as gardens, orchards,
small farms, dairies, will be made by members of the
College faculty, upon arrangement, in so far as con-
ditions will permit.

CORRESPONDENCE COURSES.

PURPOSE.

The College of Hawaii, an institution supported by taxation,
endeavors to extend its services to the people by all possible ways
compatible with the best methods of college administration.

While adequate provision should be made and fostered for collegiate work in residence, yet there exists in the community a large class of persons who for one cause or another are unable to adjust themselves to our formal system of education. Such persons manifestly have some claim upon the Territory for assistance in education outside the formal system. By correspondence study such persons may acquire knowledge in accordance with their requirements and capacities. While there are very good reasons for students coming to the College for their instruction, there are also good reasons for the College going to the people; and more especially when the College offers instruction in subjects pertaining to the vocations of life.

That people may be taught in many of the subjects of the school and college curricula through correspondence study is a demonstrated fact, and while the method lacks some of the advantages of resident study, it has certain advantages of its own. Among other things, it has a tendency to encourage self-reliance and self-determination; it affords earnest persons the opportunity of working and studying at the same time; and each student gets individual instruction. On the other hand, advanced subjects requiring extensive laboratory equipment are at a disadvantage, as the manipulation of laboratory apparatus can not be taught by correspondence.

PLAN AND SCOPE.

The College offers through correspondence study the following subjects:

Soils and Crops, Plant Life, Horticulture, Poultry Husbandry, Domestic Science, Zoology, Entomology.

The grade of instruction in these subjects is in accordance with the ability and attainments of the students. Students taking any subject by correspondence shall be not less than 15 years of age and shall not at the time of taking the course be in attendance at school.

Instruction in the subjects mentioned is given by written lessons or assignments, the student returning a written report on each lesson or assignment according to the direction of the professor in charge. These reports are carefully examined and returned to the student with such corrections, explanations or suggestions as may be to the interests of the student. If each report

meets the required standard, a new lesson or assignment is sent.

A subject consists of weekly assignments, and each assignment may contain one or more lessons. The course of instruction terminates with the close of schools in June. No preliminary examination is required, but students must satisfy those in charge of the course that they can read and write English fluently. Application blanks may be had on request, and the College will offer assistance and suggestion in the choice of subjects. Students are expected to complete at least one course in the time specified for the course.

A fee of \$5.00 is charged for each full course of 18 assignments. For additional courses a reduction of one-half for each course is made. The fee is intended to pay the cost of the lessons and postage one way. If a student takes less than half of the assignments, one-half the fee remaining above the cost of materials used is refunded.

SUBJECTS IN DETAIL.

Course 1. SOILS AND CROPS. Readings and reports on the origin and formation of soils, their physical, chemical, and biological properties, relation of soil properties to soil managements, the adaptation of crops to soil types, and the essentials of crop-producing power. The studies of crops will consist of readings and reports on the leading crops of the mainland and Hawaii, their geography, economics of production, commercial importance, products, uses, and culture methods. *Professor Krauss.*

Course 2. PLANT LIFE. Students registering in this course have an option between two lines of study. (1) A survey of the principles of botany, including the structure and physiology of the seed plants; the morphology, evolution, and classification of plants; ecology and economic botany. The text by Bergen and Davis will be furnished. Emphasis will be laid on the practical phases of plant-life, especially such aspects as are exemplified in Hawaii and in similar tropical regions. (2) A study of common plants as an aid in the nature-study work of the elementary schools. This work is planned primarily for *school teachers*. Two manuals will be furnished. This course demands a larger amount of field and observational study than option 1. The faithful performance of the work outlined in either of these sec-

tions should give the student a general knowledge of the fundamentals of plant structure and growth. *Professor MacCaughey.*

Course 3. PRACTICAL HORTICULTURE. Students registering in this course elect one of the following subjects: fruit-raising, vegetable gardening, or floriculture. In addition to regular text-book assignments, the reading of specified bulletins relating to these matters is required, and the performance of experiments. Students taking this course should have access to some piece of land, however small, upon which they can raise crops for experimental purposes. The practical problems of tillage, irrigation and drainage, fertilizers, spraying, seedage, insects and fungi, will thus be worked out on the basis of actual experience.

Professor MacCaughey.

Course 4. POULTRY CULTURE. This course treats of the underlying principles of the profitable production of poultry products. The essential business elements which lie not only in the qualification of the poultryman, but also in the quality of the stock investment will receive special consideration. The care and management of all the operations from the time the egg or the chick is produced until it reaches the consumer will receive much attention. Each student is urged to be actively engaged in some part of the business while taking the course, for observation, study and work go hand in hand in successful poultry management.

Professor Krauss.

Course 5. COOKING. This course gives some of the elements of the theory and practise of cooking. It includes text assignments on the needs of the human system as regards foodstuffs, the care and preservation of food, fireless and invalid cookery, the serving of meals and a few special diets for children.

The students are furnished with Bulletins, the reading of which is required, as well as the performance of simple experiments and cooking.

Asst. Professor Lee.

Course 6. SEWING. This course aims to teach the fundamental principles of sewing. Attention is given to the stitches, cutting, fitting and finishing of simple garments. The work is taught by means of text-books, patterns, illustrations, written directions and criticisms.

Asst. Professor Lee.

Course 7. ZOOLOGY. This course is intended to give a grounding in the subject of general zoology with especial refer-

ence to its economic aspects. It includes text assignments, written lectures and simple dissections of a number of common animals with a view to gaining an understanding of the salient points in their comparative anatomy. Notes of the life histories from the habits of animals are included in order to show the adaptation of animals to various circumstances and conditions of environment. The course is intended for teachers and others with a taste for or a knowledge of the facts and materials of zoology.

Professor Bryan.

Course 8. ENTOMOLOGY. This course gives a general survey of the characters of insects, dealing with their structures, classification, economic relations and methods of control. A reference text will be furnished for the required readings, and outlines for the practical exercises. The course demands considerable field collecting and is intended either for teachers, or for actual growers, who require a general knowledge of insect life if they are going to control pests successfully. As far as possible the lessons will be adapted to the individual needs.

Professor Illingworth.

FIRST ANNUAL COMMENCEMENT, 1912.

At the first annual Commencement of the College of Hawaii the following degrees were conferred:

LESLIE COOPER CLARK, Bachelor of Science in Agriculture.

LOUISE GULICK, Bachelor of Science.

WILLIAM JOHN HARTUNG, Bachelor of Science.

YONG FOOK TONG, Bachelor of Science in Engineering.

REGISTERED FOR A DEGREE.

Barnhart, William Harold George (*Sophomore, Engineering*)
 Boyd, Lilian (*Senior, Science*)
 Chang, Sing (*Freshman, Engineering*)
 Clark, Miriam (*Junior, Household Economics*)
 Cousens, Clayton Worth (*Irregular, Science*)
 Foster, Shirley Bradstreet (*Freshman, Science*)
 Goo, Richard Man Sing (*Freshman, Engineering*)
 Imai, Tomoso, (*Sophomore, Engineering*)
 Kau, Stephen Leon (*Freshman, Engineering*)
 Kutsunai, Yakichi (*Sophomore, Agriculture*)
 Kuwamoto, Maruichi, (*Sophomore, Science*)
 Lemke, Paul George (*Junior, Engineering*)
 Marcallino, Valentine (*Senior, Science*)
 Meinecke, William Hildebert (*Senior, Science*)
 Pratt, John Scott Boyd, Jr., (*Irregular, Agriculture*)
 Smith, Marilla Madeline (*Sophomore, Science*)
 Smith, Marilla Madeline (*Sophomore, Science*)
 Starratt, Harold Earl (*Freshman, Engineering*)
 Stickney, Fenner Satterthwaite (*Freshman, Agriculture*)
 Tracy, Edward Roberts (*Senior, Engineering*)
 Wong, Sau Chin (*Irregular, Engineering*)
 Wong, Quin (*Irregular, Engineering*)
 Yogi, Seigei (*Senior, Science*)
 Yong, En Sue (*Freshman, Agriculture*)

NOT REGISTERED FOR A DEGREE.

Alexander, Miss Agnes	Haviland, Miss Nettie
Ahuna, Herbert	Higgins, Mrs. J. E.
Aiken, Miss Irene Blowers	Hitchcock, Miss Martha Barrows
Andrade, Mrs. Jason	Hoermann, Miss Selma
Armstrong, Miss Minnie H.	Hoermann, Miss Adele
Atherton, Miss Juliette Montague	Hoffman, Miss Florence Emilie
Atherton, Miss Laura Annis	Hoogs, Miss Fanny
Atherton, Miss Violet Merriam	Horner, Mrs. Florence W.
Bairos, M. D.	Howland, Mrs. Mabel Deane
Betts, Miss Lelia J.	Hugo, Mrs. Hermann
Blake, Mrs. Gertrude J.	Hyatt, Mrs. P. P.
Blanchard, Edward B.	Kelley, Miss Clare March
Bottomley, Mrs. A. W. T.	Kennedy, Miss Jessie Kirland
Brown, Mrs. Elsie Kuhn	Klamp, Mrs. F.
Carr, Miss Marjorie Leigle	Klebahn, Mrs. F. W.
Clark, Mrs. Leslie C.	Kluegel, Mrs. Geo.
Claypool, Miss Alice	Lau, Ah Fong
Cotter, Chester	Lawrence, Miss Mary Stebbins
Cousens, Mrs. Sarah Esther	Lee, Mrs. R. B.
Creighton, Miss Marguerite	Lewis, Mrs. Chas. T.
Davies, Miss Ifolina	Lockwood, Douglas Howell
Dickson, Mrs. Mary J.	Lucas, Miss Mary Dikealii
DeGaugh, Mrs. J. A.	Lyser, Mrs. F. C.
Edmunds, Mrs. L. L.	MacDougal, Miss Evelyn
Effinger, Miss Eleanor	Macintyre, Mrs. Malcolm
Elder, Mrs. James H.	Marshall, Miss Nellie
Ellsworth, Earl Asaph	Marshall, Miss Jessie May
Freitas, Mrs. J. B.	Marsily, Mrs. G. R.
Gartenberg, Mrs. Abe	Masuda, Mrs. S. T.
Gearn, Dr. G. C.	Maury, Mrs. M. G.
Gilman, Miss Marjorie	Moore, Mrs. R. G.
Graham, Mrs. Wm. Montrose	Oleson, Mrs. Abby J.
Guild, Miss Dorothy Mary	Oleson, Miss Alice Marion
Guild, Mrs. Hulda E.	Owen, Mrs. Thomas W.
Gulick, Miss Louise	Podmore, Miss Dorothy
Haley, Mrs. Wm. R.	Reid, Miss Anna Mary
Hall, Miss C. Van Cleve	Ripley, Miss Iwalani
Hampton, Mrs. Laura Ruth	Roe, Miss Harriet Estelle
Hansen, Arthur Walter	Rothwell, Mrs. J. G.
Harbaugh, Miss Alice E.	Rouwenhorst, Miss Christina

Schaefer, Carl Theodore
Schmidt, Mrs. Wm. T.
Schroeder, Mrs. H. A.
Sedgwick, Mrs. T. F.
Shaw, Glenn W.
Shaw, Mrs. Jonathan
Sheedy, Mrs. Joseph Edward
Shepard, Mrs. Margaret
Snow, Miss Julia E.
Suehiro, Mrs. Hannah
Swezey, Mrs. Otto H.
Tallant, Henry Chas.

Tanaka, Kintaro
Thomas, Miss Clara May
Thompson, Mrs. Uldrich
Tulloch, Alexander Russell
Tung, Miss Ah Sun
Truman, Miss Eleanor E.
Walker, Miss Agnes E.
Wilder, Mrs. Chas.
Wetmore, J. B.
Willard, Mrs. H. F.
Warren, Alfred
Whiting, Miss Ethel

ENROLLED IN CORRESPONDENCE COURSES.

Soils and Crops.

Ignacio, Amos J.....Papaaloa, Hawaii
 Bradley, Mrs. K. R.....Pepeekeo, Hawaii
 Raymond, George S.....Lahaina, Maui
 Wood, Miss Florence.....Honolulu, Oahu

Poultry Culture.

Allen, Ernest G.....Holualoa, Hawaii
 Cockett, E. G.....Lahaina, Maui
 Lindsey, Miss Ernestine.....Haiku, Maui
 Lyman, N. K.....Hilo, Hawaii
 Severance, Miss Helen.....Hilo, Hawaii

Practical Horticulture.

Smith, Mrs. L. M.....Kahuku, Oahu
 Wilson, J. A.....Lahaina, Maui

General Botany.

Cockett, J. P.....Ulupalakua, Maui
 Lindsey, Edwin.....Kohala, Hawaii

Zoology.

Lougher, Robert.....Papaikou, Hawaii

Sewing and Cooking.

de Bretteville, Mrs. A.....Lihue, Kauai
 Boardman, Miss E. T.....Laupahoehoe, Hawaii
 Case, Miss Katherine.....Hana, Maui
 Hodge, Mrs. C. L.....Kekaha, Kauai

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